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RI/FS WORK PLAN

MEDLEY FARM SITE
GAFFNEY, SOUTH CAROLINA

AUGUST, 1988

SEC JOB NO. G-8026

SIRRINE ENVIRONMENTAL CONSULTANTS
GREENVILLE, SOUTH CAROLINA

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

This work plan has been prepared by Sirrine Environmental Consultants for the Medley Farm Site Remedial Investigation/Feasibility Study (RI/FS) at the direction of the Medley Farm Site Steering Committee. The RI/FS is being prepared under an Administrative Order of Consent signed in January 1988 from EPA Region IV.

The purpose of the Work Plan is to provide a detailed scope of work and technical approach for the RI/FS, as well as a schedule for completion of the project. The Work Plan for the Remedial Investigation (RI) is organized as follows:

- Project Operations and Data Base
- Field Investigations
- Chemical Analyses
- Data Validation and Interpretation
- Remedial Investigation Report

For the Feasibility Study, the Work Plan is organized as follows:

- Review of the Remedial Investigation
- Remediation Guidelines
- Preliminary Identification and Screening of Remedial Alternatives
- Treatability Studies
- Detailed Analysis of Remedial Alternatives
- Feasibility Study Report

A schedule and staffing plan will be given for the RI and FS in the Project Operations Plan, after discussions on the Work Plan with the Steering Committee and EPA Region IV.

Development of this preliminary Work Plan is based on a thorough review and evaluation of the site documents held by EPA Region IV. It also reflects the discussions and modifications agreed upon during a site visit conducted by EPA Region IV staff and SEC representatives and a review meeting conducted at Region IV Headquarters in Atlanta, Georgia. Additional input to the document came from available data on the area geology, hydrology and physiography and characteristics of the suspected compounds disposed of on-site. Only limited data is presently available at the site and close coordination will be maintained throughout the project to ensure field activities are properly targeted.

The overall objectives of conducting the RI/FS are to characterize the type and extent of on-site contamination of ground water, surface waters, and surface and subsurface soils and to collect site-specific information on the geology, hydrology and physiography of the site. The collected information will be validated and then used to estimate the potential for contaminant migration and determine the necessity for and proposed extent of remedial action (NCP 300.68(e)). The FS will evaluate, to the degree necessary, the feasibility of potential remedial alternatives that will eliminate or minimize the uncontrolled release of hazardous substances from the Medley Farm site. The ultimate goal of the RI/FS process is to protect and preserve the public health and welfare and the environment.

2.0 SITE OVERVIEW

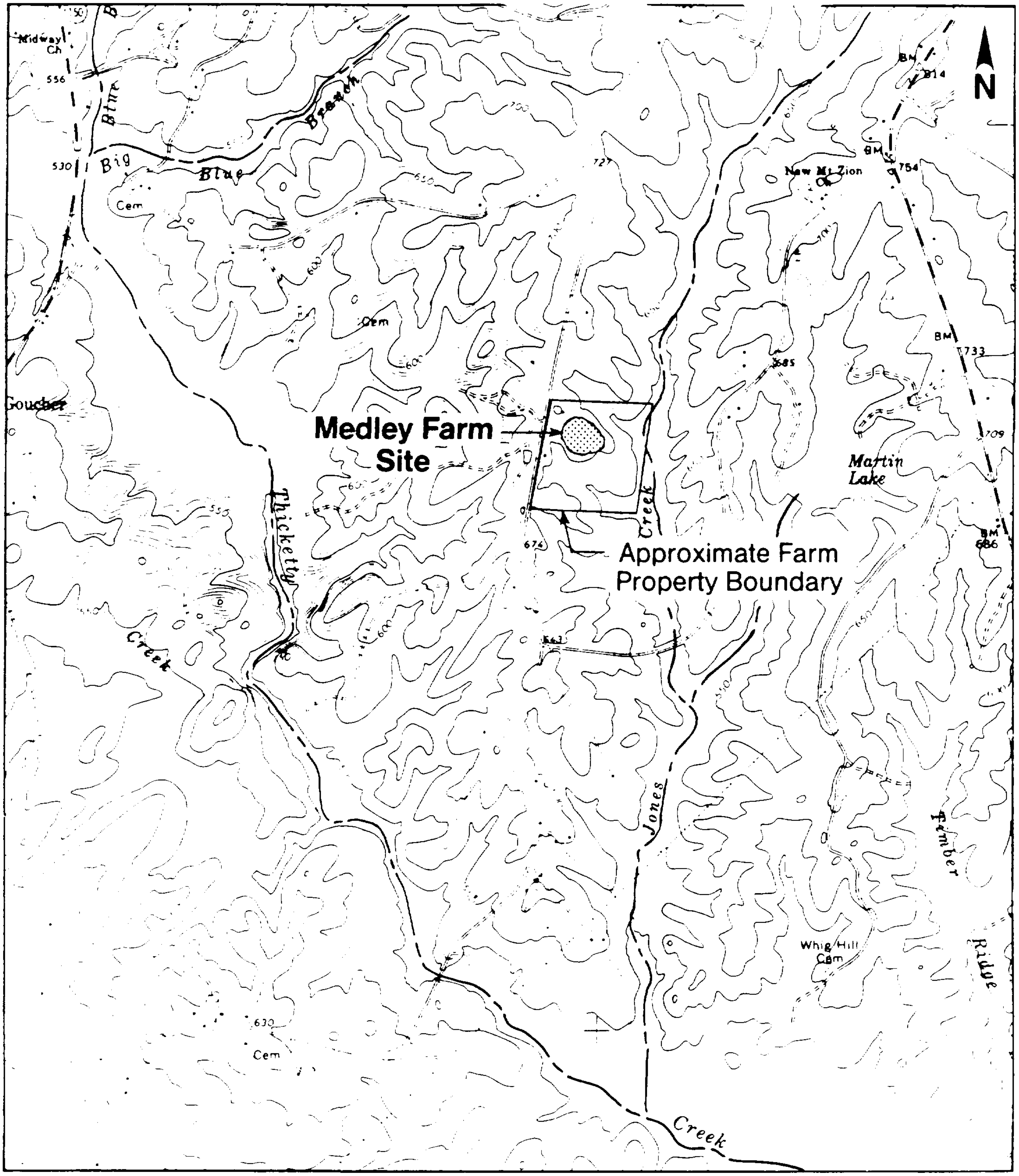
2.1 ENVIRONMENTAL SETTING

The Ralph Medley Farm occupies 61.9 acres of rural land approximately six miles south of Gaffney, South Carolina in Cherokee County on County Road 72 (Burnt Gin Road). The approximate property boundaries are shown in Figure 2.1. The Medley Farm site consists of an approximately 7-acre section of the Ralph Medley Farm parcel that is situated on top of a small hill. The approximate center of the site is located at latitude 34°58'54" north and longitude 81°40'2" west. The surrounding land is hilly and consists mainly of woods and pasture land. The land use in the vicinity of the site is primarily agricultural (farms and cattle) and light residential.

The Medley Farm site ranges in elevation from 680 to 700 feet above mean sea level. Topography of the site area is relatively flat but the adjacent land slopes off steeply to the east and south. Surface water drainage from the site flows into Jones Creek, located along the eastern property boundary. Jones Creek flows into Thicketty Creek which then drains into the Broad River.

2.1.1 Geology

The Medley Farm site is located in the Piedmont physiographic province. This province is characterized by fractured and faulted igneous and metamorphic rocks of Precambrian and Paleozoic age. These crystalline rocks are grouped into six northeast-trending lithologic belts which are interpreted to be zones of different grades of regional metamorphism. The belts are, from southeast to northwest: the Carolina slate belt, the Charlotte belt, the Kings Mountain belt, the Inner Piedmont belt, the Brevard belt, and the Blue Ridge belt.



USGS Pacolet Mills Quadrangle (1969)

Scale 1:24,000

Figure 2.1

Approximate Boundaries of Medley Farm Site and Farm Property

Medley Farm Site Gaffney, South Carolina

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The site is in the Kings Mountain belt, which consists of metasedimentary and metavolcanic rocks of low to moderate metamorphic grade. Rock types include schists, quartzite, marble, gneiss, and granite, with minor units of soapstone, pyroxenite, and mafic rocks. Rocks in the Kings Mountain belt reflect an episode of Carboniferous- to Permian-age metamorphism of sedimentary rocks. Metamorphism was accompanied by folding, fracturing, intrusion of cross-cutting granites, and the upgrading of earlier formed minerals along granite contacts (Overstreet and Bell, 1965).

No rock outcrops have been observed at the site or in the immediate vicinity. However, according to a map published in 1965 by Overstreet and Bell, the specific rock types underlying the site are hornblende gneiss and quartz monzonite. The scale of that map is small; consequently this interpretation may be modified based on site field investigations. Regional strike of the rocks is to the northeast and regional dip is southeast. This has been a consideration in the initial siting of monitoring wells presented in Section 3.6.3.

Soils in Cherokee County are primarily residual soils (saprolite) derived from in-situ weathering of the underlying bedrock. This soil layer, or overburden varies in thickness. It is thinner on hilltops where erosion has been most active, and thicker in valleys, where less erosion and more deposition has occurred. The site is on a ridgetop, but erosion has incised valleys, or gullies, very near the site.

2.1.2 Hydrogeology

In general, a dual aquifer system exists in the Piedmont Province. The surficial aquifer consists of saprolite and wells completed in these materials produce low yields. The bedrock aquifer is either igneous or metamorphic rock with secondary porosity; well yields depend on the nature of the fractures that the well encounters. The surficial aquifer has higher porosity but due to its low hydraulic conductivity acts mainly as a storage media and recharge source for the bedrock aquifer.

Two wells drilled at the Medley Site in 1984 indicate that the water table may occur relatively deep at this site location. This may serve to isolate significant portions of any residual contamination that may remain on-site. One well was drilled to 54 feet below land surface (bls) without encountering the water table. A second well bottomed out at 85 feet bls and had 20 feet of standing water prior to development. The well was then pumped dry and required 45 minutes of recovery time in order to collect approximately one-half liter of water. Both wells were in saprolitic deposits and point to the surficial aquifer here being primarily a storage media for recharge to the bedrock aquifer. Therefore, the major volume of ground water flow away from the site is believed to be within the bedrock aquifer.

Surface topography and the direction of dip of the rocks is to the southeast at the site. Surficial ground water flow in the aquifers at the site would most likely follow the surface topography and, thus, move toward the major streams. Since Jones Creek and the Big Blue Branch are described as perennial streams, some ground water discharge would be expected to occur. The source of the baseflow - the surficial aquifer, bedrock aquifer, or both aquifers -would have to be determined through field studies. Thicketty Creek, the largest stream in the area, has cut and flows within an alluvial valley. It may be a ground water flow divide for the surficial aquifer and, possibly, the bedrock aquifer. Monitoring wells and other field activities have been constructed to evaluate these situations.

In summary, the surficial aquifer at the site exhibited low flow capacity and is locally believed to be mainly a source of recharge for the bedrock aquifer. Ground water flow in the aquifers at the site would most likely be predominantly within the bedrock aquifer and would follow the topography toward the major streams. Jones Creek, the Big Blue Branch, and Thicketty Creek are all perennial streams, and therefore, receive baseflow during long, dry periods. These streams may be flow divides for the surficial aquifer, but due to the fractured nature of the bedrock, deep underflow within this aquifer may occur.

Information will be developed in the RI to evaluate whether Jones Creek, the Big Blue Branch, or Thicketty Creek act as permanent ground water flow divides for both the surficial and bedrock aquifers in this area.

2.1.3 Surface Waters

The Pacolet Mills 7.5 minute quadrangle, as shown in Figure 2.1, labels Jones Creek, the Big Blue Branch, and Thicketty Creek - the three largest streams surrounding the site - as perennial streams. Jones Creek and the Big Blue Branch are fed by lakes and intermittent streams. Thicketty Creek is the largest of the three and is fed by other perennial streams and smaller intermittent streams. Flow in perennial streams during long, dry periods would be due only to ground water discharge (baseflow) and outflow from lake storage. The Medley site appears to have the greatest potential for potentially impacting surface water in Jones Creek. For this reason sampling efforts have been directed towards evaluation of this surface feature.

Jones Creek and the Big Blue Branch both flow into Thicketty Creek. Thicketty Creek empties into the Broad River. Thicketty Creek from the Cowpens discharge tributary to the Broad River is classified as a "B" stream. Class B streams are freshwaters suitable for secondary contact recreation and as a source for drinking water supply after conventional treatment in accordance with the requirements of the State. Jones Creek and the Big Blue Branch are not among the classified waters in the South Carolina water classification standards.

2.1.4 Climate

The climate of the area is generally mild, with average summer temperatures of 76.4°F and average winter temperatures of 41.9°F. The average annual temperature is 60.0°F. Total precipitation for the area is 50.1 inches and total evapotranspiration is 37.8 inches, giving a net precipitation of 12.3 inches (Smith, 1987). The one-year, 24-hour maximum rainfall is 3 inches.

Climatological information is based on data collected at Spartanburg, South Carolina, located approximately 18 miles west of the Medley site.

2.2 SITE HISTORY

The Medley (also known as Burnt Gin) Farm is owned by Ralph C. Medley, who acquired the property from William Medley in 1948. Prior to the mid-1970s, the site was maintained as woods and pasture land. Available information indicates that disposal of drummed and other waste materials began at the site in 1973. Waste disposal at the Medley site reportedly stopped in June 1976. At the time of the SCDHEC inspection, drums were stored on site in a random fashion. Some were in open pits or one of six small lagoon areas. No formal records of disposed waste materials were kept at the Medley Farm Site.

2.3 SITE INVESTIGATIONS AND REMEDIATION

On May 3, 1983, members of the Compliance and Enforcement Section of the SCDHEC Bureau of Solid and hazardous Waste Management visited the Medley Farm site and observed approximately 2,000 55-gallon drums in various states. The drums were piled randomly over the area and a chemical odor was noted. A number of shallow excavations were observed which contained discolored standing water. It was noted that some drums were standing or lying in the water in these pits and it was noted that some burial of drums may have occurred. A number of the drums were observed to be in a deteriorated condition. Areas of distressed vegetation were noted where possible drum discharges may have occurred. In addition to the 55-gallon drums, there were several hundred plastic containers of various sizes. Most of these drums were in a condition that markings were no longer visible. Contents of most drums could not be identified.

Based on this inspection, SCDHEC returned on May 19, 1983 to collect samples of drum contents and soils for analysis. Results of analyses reported a number of volatile organics, including methylene chloride, trichloro-ethylene and trans-1,2-dichloroethylene, and base neutral extractable compounds. No acid extractable compounds were detected among the analyses performed. Certificates of analysis for the May 1983 SCDHEC investigation are given in Appendix A.

SCDHEC informed EPA of the sampling results and EPA visited the site the week of May 30, 1983. Samples were collected for analysis. Among the contaminants found were: methylene chloride, vinyl chloride, tetrachloroethylene, phenol, toluene, trichloroethylene and 1,2-dichloroethane. One on-site composite soil sample contained polychlorinated biphenyls (PCBs) at low levels. Available certificates of analysis for the May 1983 EPA investigation are given in Appendix B.

An immediate emergency removal action was initiated on June 20, 1983 by O.H. Materials Company pursuant to Section 104 and other provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). A total of 5,383 drums and 15-gallon containers were removed from the site. These included fully, partially full and empty containers. Compatibility testing of drum contents was done prior to bulking of liquid wastes. Empty drums were crushed and taken to a sanitary landfill. The bulked liquids (24,200 gallons) were taken off-site by tanker and incinerated. The solid waste and contaminated soils, totalling 2132 cubic yards, were taken to an approved hazardous waste landfill. Three drums containing PCBs were overpacked and sent to an approved disposal facility. An estimated 70,000 gallons of water were drained from the six small lagoons and treated in a pressurized sand/gravel/activated carbon filtration system for the removal of organics. The treated effluent was analyzed to ensure it met state discharge standards prior to release into Jones Creek. The lagoons were then backfilled with clean earth and graded to the natural topography. Remedial actions were completed on July 21, 1983.

Analytical testing of the drum contents, as well as the water and sediment in the lagoons during the removal action , indicated the presence of organic compounds. These included: toluene, benzene, methylene chloride, tetrachloroethylene and vinyl chloride. Samples from adjacent homeowners' wells were collected by SCDHEC on June 23, 1983 and found to contain methylene chloride.

NUS conducted a geological and geophysical study of the Medley Farm site at the direction of EPA during the week of August 1, 1983. The study was designed to determine the potential for ground water contamination at the site. To accomplish this, a literature search on the geology and hydrology of the area and a field study of the site were performed. The field study included electrical resistivity soundings, a magnetometer survey and an electromagometer (EM) survey. Results of the EM survey are shown in Figure 2.2 The NUS report concluded that the most likely source of the anomalies shown in Figure 2.2 was suspected surface and subsurface soil contamination from previous disposal practices. The magnitude of the anomalies indicated that buried drums are not likely except in one small area as shown in Figure 2.2. The report could not estimate the depth of suspected soil contamination.

Possible fracture zones were estimated from linear surface features called lineaments in the geological assessment. The NUS report concluded that such traces may be conduits for ground water contamination but could not estimate the extent of contamination in these hydrologic systems. Results of the EM survey indicated that suspected subsurface contaminants may have migrated as much as several hundred feet to the southeast, but this is based only on this screening procedure and has not been verified with any sampling. The NUS report stated that the suspected contaminants were most likely confined to the soil layer above the impermeable bedrock.

SCDHEC revisited the site in April of 1984 to perform a preliminary geohydraulic investigation and install a monitoring well. An attempt to construct a well (MD2 in Figure 2.2) was ended when the borehole reached 54 feet without encountering saturated conditions due to auger refusal. A second borehole was advanced at a lower elevation (MD2A in Figure 2.2) that encountered saturated conditions at 65 feet and a monitoring well was installed. Soil from both boreholes and ground water from the well were analyzed for volatile organics, primary metals, acid and base-neutral

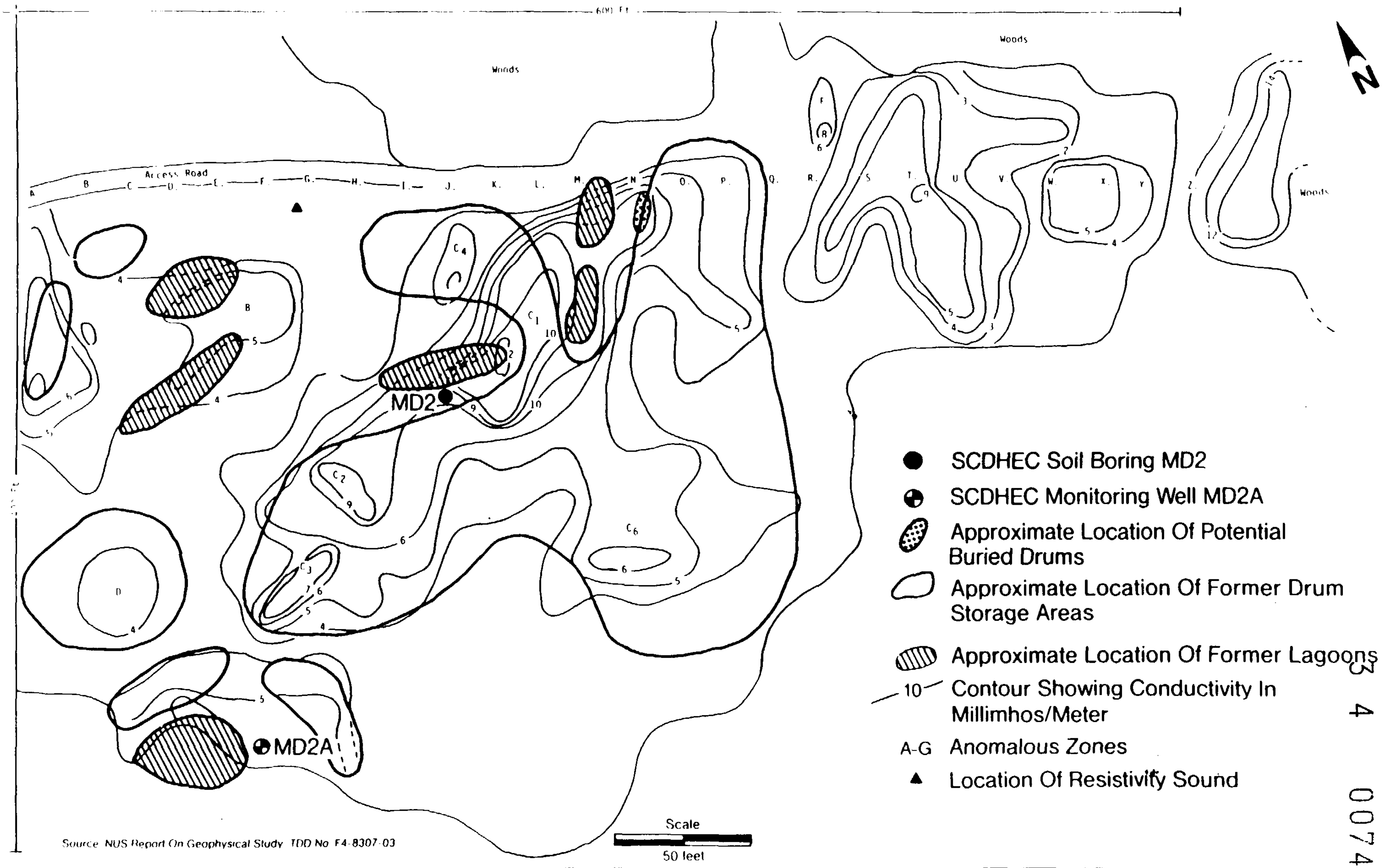

Figure 2.2

Approximate Locations Of Former Drum Storage Areas And Lagoons

Medley Farm Site Gaffney, South Carolina

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extractables. Volatile organic analyses of soil taken at 10 feet in borehole MD2 showed 81.4 ug/kg of methylene chloride and 102 ug/kg of 1,2-dichloroethane as the only quantifiable compounds. Ground water sampling results for the volatile organics are given in Table 2.1. Certificates of analysis for the April 1984 SCDHEC investigation are given in Appendix C.

Monitoring well MD2A was resampled by SCDHEC in July of 1984. Four private wells off-site were resampled at this time as well. Results from the monitoring well and one private well (Sprouse) are given in Table 2.1. Based on these analyses, SCDHEC advised the owner of the Sprouse well to no longer use it as a source of drinking water. It should be noted that based on all available information and the surface topography of the area, the Sprouse well would appear to be upgradient of any site activities indicating any contamination identified would not be associated with the Medley Farm Site. The background well locations have been sited to further confirm this observation. This was discussed and agreed upon during the site visit conducted in May 1988 by EPA Region IV and SEC. None of the other private wells sampled (Sarrett, Pittmann, Davis) showed signs of contamination. Locations of the residential wells and certificates of analysis for the July 1984 SCDHEC investigation are given in Appendix D. Analysis of the other three private wells did not indicate the presence of volatile organics. No further analyses of soil or ground water from the site are known to have been performed since July of 1984.

The Medley Farm site was subsequently evaluated by the U.S. EPA in June 1985, using the Hazard Ranking System (HRS). A migration score of 31.58 was assigned based entirely on the ground water route. The Medley Farm Site was proposed for addition to the National Priorities List (NPL) in June 1986.

The extent of potential residual soil contamination is unknown. Any contaminated soil on-site was either removed by past remediation efforts or covered with clean earth during the immediate response action. "Numerous pockets of buried gelatinous material" were found by SCDHEC, during installation of a monitoring well in April 1984. These were observed and noted by EPA during the May 1988 site visit.

TABLE 2.1

GROUND WATER ANALYSES AT THE MEDLEY FARM SITE

Volatile Organic Analysis - Well MD2A

		Date of Collection	
		April 13, 1984 (1)	July 18, 1984 (2)
1)	methylene chloride	39.05 ug/l	9.22 ug/l
2)	1,1-dichloroethene	1,887 ug/l	1,645 ug/l
3)	1,1-dichloroethane	160.5 ug/l	43.7 ug/l
4)	trans-1,2-dichloroethene	37.9 ug/l	28.0 ug/l
5)	chloroform	8.0 ug/l	3.56 ug/l
6)	1,2-dichloroethane	22.05 ug/l	7.53 ug/l
7)	1,1,1-trichloroethane	3,362 ug/l	2,188 ug/l
8)	carbon tetrachloride	3,804 ug/l	830 ug/l
9)	trichloroethene	6.6 ug/l	3.143.9/l
10)	1,1,2-trichloroethane	66.9 ug/l	15.3 ug/l
11)	toluene	29.6 ug/l	*
12)	tetrachloroethene	2.5 ug/l	*

Volatile Organic Analysis - Sprouse Well (2)

1)	methylene chloride	678 ug/l
2)	1,2-dichloroethane	2.51 ug/l

* - No value given in SCDHEC analytical results.

References: 1. Workman, 1984(a)
2. Workman, 1984(b)

No sampling of surface waters or sediments has been done in Jones Creek, the Big Blue Branch, or Thicketty Creek.

2.4 PRESENT SITE CONDITIONS

All visible drums were removed from the site during the emergency action in June-July of 1983. The electromagnetic survey conducted in August of 1983 indicated the potential for buried drums remaining on-site is unlikely except in one small area. This area will be confirmed during RI test pitting activities. Sludge was removed from the six small lagoons during the emergency action as well. The lagoons are currently covered with clean earth and graded to the surrounding topography. The type and extent of residual soil and ground water contamination, if any, is presently unknown.

The Medley property is no longer in use as a farm. While there are no barriers to prevent access by the public, the site is in a remote location and should receive little traffic.

3.0 REMEDIAL INVESTIGATION TECHNICAL APPROACH

The current understanding of suspected residual contamination at the Medley Farm site is based on interviews with former employees, records of the emergency response action at the site, inspections by EPA and SCDHEC, resulting analytical information, and present conditions observed at the site and surrounding area. The reported site history indicates that past disposal practices may have resulted in soil and ground water contamination at the site and potential contamination of surface waters and off-site ground water. While the majority of source material was removed, contaminated soils and sludges may remain on the site. The potential for buried drums to still be on-site is considered slight.

Based on the gathered data, the objectives of the Remedial Investigation (RI) will include:

- developing an accurate topographic site map
- determining the nature and extent of soil contamination, if any
- determining the presence of any remaining drums or other containerized waste materials
- determining the nature and extent of ground water contamination, if any
- determination of potential mechanisms for off-site transport of contamination
- identification of potential receptors and analysis of the predicted impact of contamination on off-site receptors
- identification of potential areas for remediation

Specific tasks will include sampling of soils, ground water, surface water and any residual waste materials which may be present plus a geologic and a hydrogeologic assessment of the site and surrounding areas.

The first step in the RI will be to review any additional site inspection or analytical information held by EPA or SCDHEC, to identify any additional areas or contaminants of concern. A site survey and aerial photography will then be conducted to assess the present conditions of the site and to provide a base map for accurately locating potential residual source areas and sampling points. A Project Operations Plan and Health and Safety Plan will then be developed and submitted to EPA Region IV for approval to guide all site investigation operations.

The RI field investigations will be conducted in a series of phases to allow for adequate evaluation of data collected in each step and for re-assessment of proposed sampling locations and analytical parameters. The break between Phase IA and Phase IB will be for the evaluation of TCL analyses, serving as a source characterization, and the development of a site-specific list of indicator parameters. The objectives and major elements of each phase are outlined below.

Objectives of the Phase IA Field Investigations are:

- Investigate the potential presence of residual sources of contamination at the site
- Characterize residual sources of contamination which may be present
- Provide an initial assessment of the horizontal extent of residual sources and soil contamination which may be present at the site
- Develop a set of site specific indicator parameters for use during subsequent sampling and analyses
- Provide initial characterization of the geology and hydrogeology of the site to guide subsequent assessment efforts
- Provide an initial assessment of the potential presence of ground water contamination resulting from former activities at the site
- Characterize the nature of ground water contamination which may be present and ground water flow directions at the site

Phase IA Field Investigations will include:

- A soil gas survey to confirm the selection of appropriate locations for source characterization efforts
- Excavation of eight (8) test pits for initial source characterization
- Installation of four (4) well pairs (8 wells) for ground water sampling and periodic (bi-monthly at minimum) water level measurement
- Phase IA ground water sampling (two well pairs -- MW-2 and MW-4)
- Hydraulic testing (slug tests)
- TCL analyses of four (4) ground water samples and eight (8) soil samples.

Objectives of the Phase IB Field Investigations are:

- Characterize the horizontal extent of any residual sources or soil contamination identified during the Phase IA field investigation to the extent required for the assessment of remedial alternatives
- Investigate the vertical extent of residual sources and soil contamination which may be present
- Investigate the extent of ground water contamination which may be present
- Gather additional data sufficient to support the assessment and feasibility of remedial alternatives

Phase IB Field Investigations will include:

- Soil borings for additional source characterization
- Up to seven additional test pits
- Surface water and sediment sampling
- Ground water sampling of all monitoring wells
- Hydraulic testing (pump test)
- Sediment and surface water sampling

- Analyses of ground water, soil, stream sediment and surface water samples for the list of indicator parameters developed during Phase IA.

Phase II (if required):

- The need for any additional work to support the assessment of remedial alternatives and impacts to potential receptors will be evaluated after completion of Phase I and the initial RI draft.

The following sections of this draft Work Plan describe more fully the tasks and procedures for each phase of the RI. Specific details, involving areas such as sampling, health and safety, and quality assurance, will be addressed in detail in the Project Operations Plan (POP), which is the working document for the site investigation. These details cannot effectively be developed until the Work Plan has been approved by EPA and the scope of work fully defined.

The RI Work Plan has been prepared in accordance with the EPA document Guidance on Remedial Investigations Under CERCLA (EPA/540/G-85/002) and other related EPA Region IV guidance on sampling and analytical procedures. The final revision of this document and the POP will be prepared in consultation with EPA Region IV.

3.1 SURVEY AND SITE MAP PREPARATION

The development of an aerial survey topographic map of the site and surrounding area will be conducted at the outset of the RI. The purpose of the map will be to develop the required base maps, to clearly delineate the property boundaries, to indicate drainage patterns, to accurately position the locations of known and potential disposal areas, and to indicate the position of monitoring wells, boreholes and stream sampling stations used in the RI. Aerial photographs taken at the same time will be examined for evidence of additional disposal areas, such as vegetative distress, and other anomalies.

The general topographic map will encompass an area approximately 4000 feet (north-south) by 3000 feet, with the disposal area situated in the northwest corner of the map. This is done because surface drainage and ground water flow is to the south and east. The map will also include areas of Jones Creek, for location of stream sampling locations and will extend to the northwest to encompass the property surrounding the Sprouse well. Property boundaries will be indicated on the map using public records, where available, or a boundary survey, if necessary. The general map will have a scale of one inch equals 100 feet with a 2-foot topographic contour interval. Bench marks will be established during ground control for reference during well installation and for locating sampling points. Land surveying of the 7-acre disposal area may be added if better resolution is required.

Topographical information from the aerial survey will be recorded on digitized tape. The tape data will then be transferred to a computer aided design (CAD) system. This will allow for rapid reproduction of all or part of the topographic map for use in subsequent evaluations of the site.

3.2 BACKGROUND DATA REVIEW AND ANALYSIS

3.2.1 Receptor and Transport Pathway Identification

Potential receptors of off-site migration of contaminants will be identified based on conceptualization of potential off-site transport pathways. Once the field investigations are completed, the actual transport pathways will be identified and then possible receptors will be determined. This information will support the development and analysis of remedial alternatives.

3.2.2 Fracture Trace Analysis

The aerial photographs taken for the preparation of the site topographic plans will be examined for the identification of linear features which may be surface expressions of vertical or nearly vertical fractures in the underlying bedrock. Identification of fracture traces will provide further data for the interpretation of probable ground water flow directions and potential pathways for contaminant migration. Although major lineaments can be identified on available 1:24,000 U.S.G.S. topographic maps, smaller scale features which may be present should be discernable on the aerial photographs. This information will be used to refine proposed monitoring well locations. The aerial photographs will also be examined for any evidence of stressed vegetation or other features which might augment source characterization.

3.3 PROJECT OPERATIONS PLAN

The Project Operations Plan (POP) identifies detailed procedures for conducting all field activities supporting the Remedial Investigations. The POP also identifies individuals responsible for conducting and providing oversight for the RI. The POP will be prepared after the Final Work Plan has been approved and the scope of work has been defined. Areas to be addressed in the POP include the following:

- Site Specific Health and Safety Plan (Section 3.4)
- Sampling Plan (Section 3.5)
- Site Management (Section 3.5)
- Quality Assurance Plan (including field and laboratory procedures)(Section 3.6)
- Data Management (Section 3.5)

Elements of these areas are discussed in the given sections, while the specific details will be presented in the POP itself.

The Remedial Investigation cannot proceed until the POP has been approved by the USEPA Region IV, Environmental Services Division. The POP is subject to revision throughout the investigation to accommodate each phase of the RI process and unexpected field conditions. The first step in the project schedule will include preparation of the POP by the selected contractor and review and approval by EPA.

3.4 HEALTH AND SAFETY PLAN

The Project Operations Plan (POP) will include a site-specific plan that gives the health and safety requirements for each task and/or phase of the RI. The plan will identify individuals responsible for monitoring all field activities for compliance with the established health and safety procedures. The health and safety component of the POP will describe personnel monitoring and decontamination procedures in detail. It will also address health and safety training procedures and requirements for all on site personnel, including subcontractors. The health and safety plan for the Medley Farm site will be prepared in accordance with the document Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (NIOSH/OSHA/USCG/EPA) and recent regulatory updates.

3.5 DATA MANAGEMENT

Data management procedures will be developed and described in the Project Operations Plan (POP) to ensure reproductibility of all field activities. Bound field log books with numbered pages will be maintained for each activity, and will include detailed descriptions of all sampling procedures, and records of individuals responsible for collecting samples. Specific data management requirements will be followed as described in the site Project Operations Plan (POP).

3.6 PHASE I FIELD INVESTIGATION

3.6.1 Soil Gas Survey

A soil gas survey will be conducted prior to test pitting, drilling, and well construction efforts to delineate source areas. This effort is principally a reconnaissance tool to further define source areas. It will be used to assist in the placement of the initial test pits. Data generated from the soil gas analyses will be used in conjunction with the existing data base to select optimum locations for subsurface investigations, ground water and soil sampling, and site remediation activities.

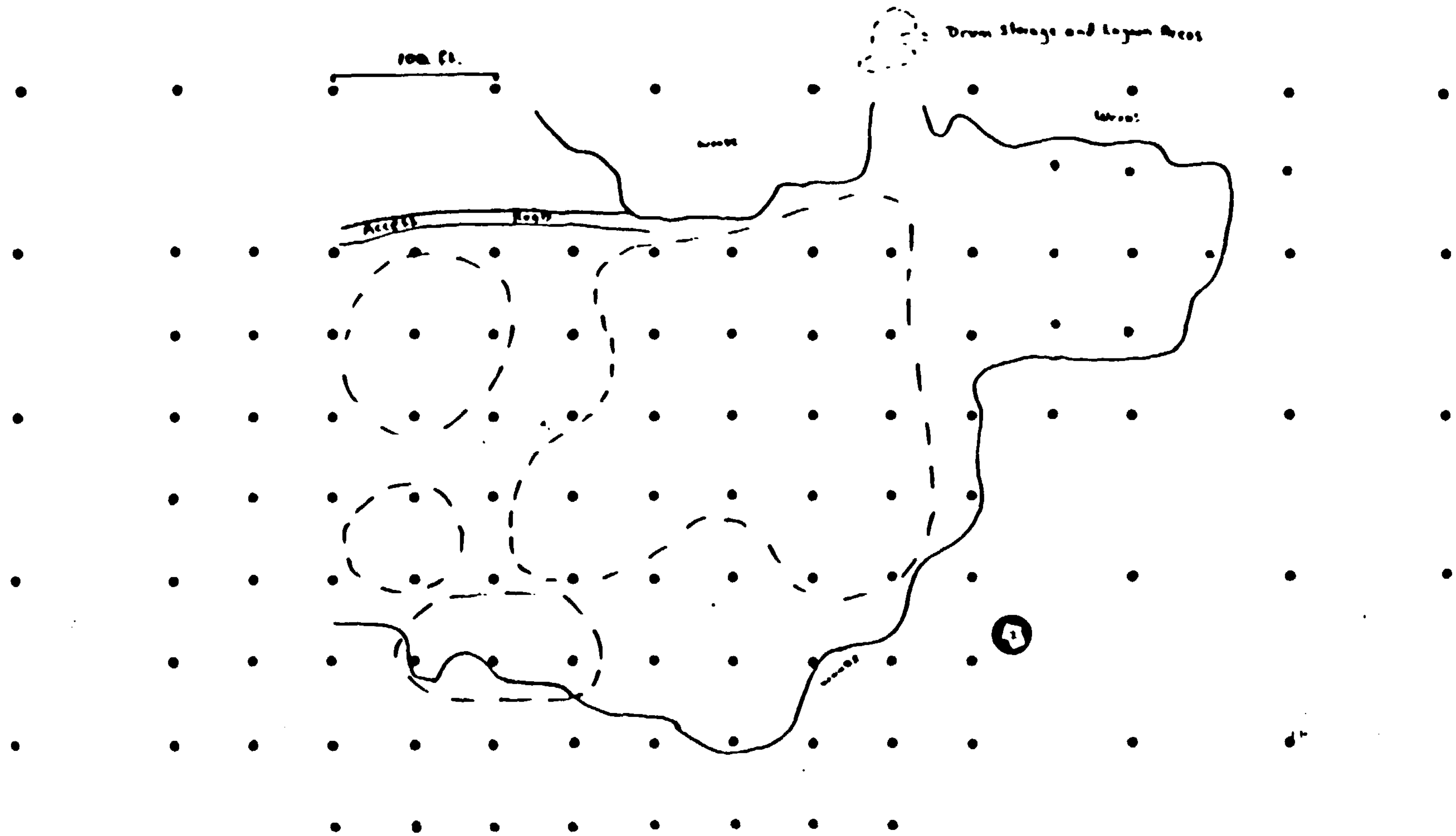
The Petrex soil gas technique will be used to provide time integrative gas collection and therefore minimize the effect of short term environmental variables (precipitation, evapotranspiration, etc.). This method involves the installation of activated carbon collectors fused to the tip of curie-point ferromagnetic wire. Receptors are buried approximately ± 18 inches below the surface.

Multiple receptors are buried at key locations and retrieved each week to assess the degree of response. The collectors are retrieved after an optimally measured time period and then returned to a Petrex laboratory for analysis by curie-point desorption mass spectrometry. The wire is placed directly into the high vacuum region of the mass spectrometer where the thermally desorbed VOC's are ionized, separated according to ion mass, and counted.

Compound identification is accomplished by comparing mass spectra from the survey collection data set to an extensive reference library of mass spectra of pure compounds and common compound mixtures. The resultant data will then be displayed in the form of isopleth contour maps based on the ion count flux data for each compound or mixture identified at each sample location of background areas along with downgradient migration pathways. The final collector locations will be determined by the field geologist on site. Every effort will be made to adhere to the proposed locations; however, some locations may be adjusted to avoid topographical obstacles. For QA/QC, ten receptors will be used for time calibration and five as trip blanks. A preliminary grid pattern is included as Figure 3.1.

A total of 115 soil gas collector locations are proposed in the area of and adjacent to the site. The sampling design incorporates a variable spacing grid system with sample spacings of 50 to 100 feet. The densest portion of the grid system (50′ centers) is located in the old drum storage and lagoon areas. This should allow delineation of source areas and identification of potential migration pathways within these areas. The surrounding area is covered with an 100′ reconnaissance grid in order to establish the location of background areas along with downgradient migration pathways.

FIGURE 3.1
PRELIMINARY GRID PATTERN
FOR SOIL GAS SURVEY



3.6.2 Test Pits

Test pits will be excavated to provide initial source characterization in and around the former lagoon and drum storage areas. The objective of source characterization is to determine the potential presence and remaining concentrations of residual contaminants, if any, at each of the known and suspected disposal and storage areas. This information is used primarily to evaluate alternatives for source control. Test pits will allow sampling and direct visual characterization of any residual wastes which may be present and assessment of former lagoon bottom conditions.

At least one test pit (two pits at two locations) will be excavated through each former lagoon area and at potential sites of residual soil contamination identified during the soil gas survey. The proposed locations of test pits at former lagoon sites are shown on Figure 3.2. Based on the size of the remaining site area, it is estimated that 7 additional test pits will be required in Phase IB, to characterize potential source contamination outside of the lagoons. This gives a total of 15 test pits. Eight (8) of the proposed test pits will be excavated during Phase 1A to collect samples which will be used to develop the site-specific indicator parameter list. The remaining seven (7) test pits will be excavated during Phase IB. One additional test pit will be excavated to investigate the source of the geophysical anomaly referred to in the conclusions of the NUS report as a potential "buried drum" location. This location is shown on Figure 3.2.

The test pits will be excavated with a standard backhoe which will be cleaned between excavations with a high pressure source of potable water to remove all visual traces of soils. A steam cleaner will be used for additional decontamination if residual sludges are encountered and proper final rinse procedures will be utilized.

Organic vapor analyzers will be used in the field to screen soils exposed in the test pits. Based on the results of the organic vapor screening and visual assessment, a minimum of one composite soil sample will be selected

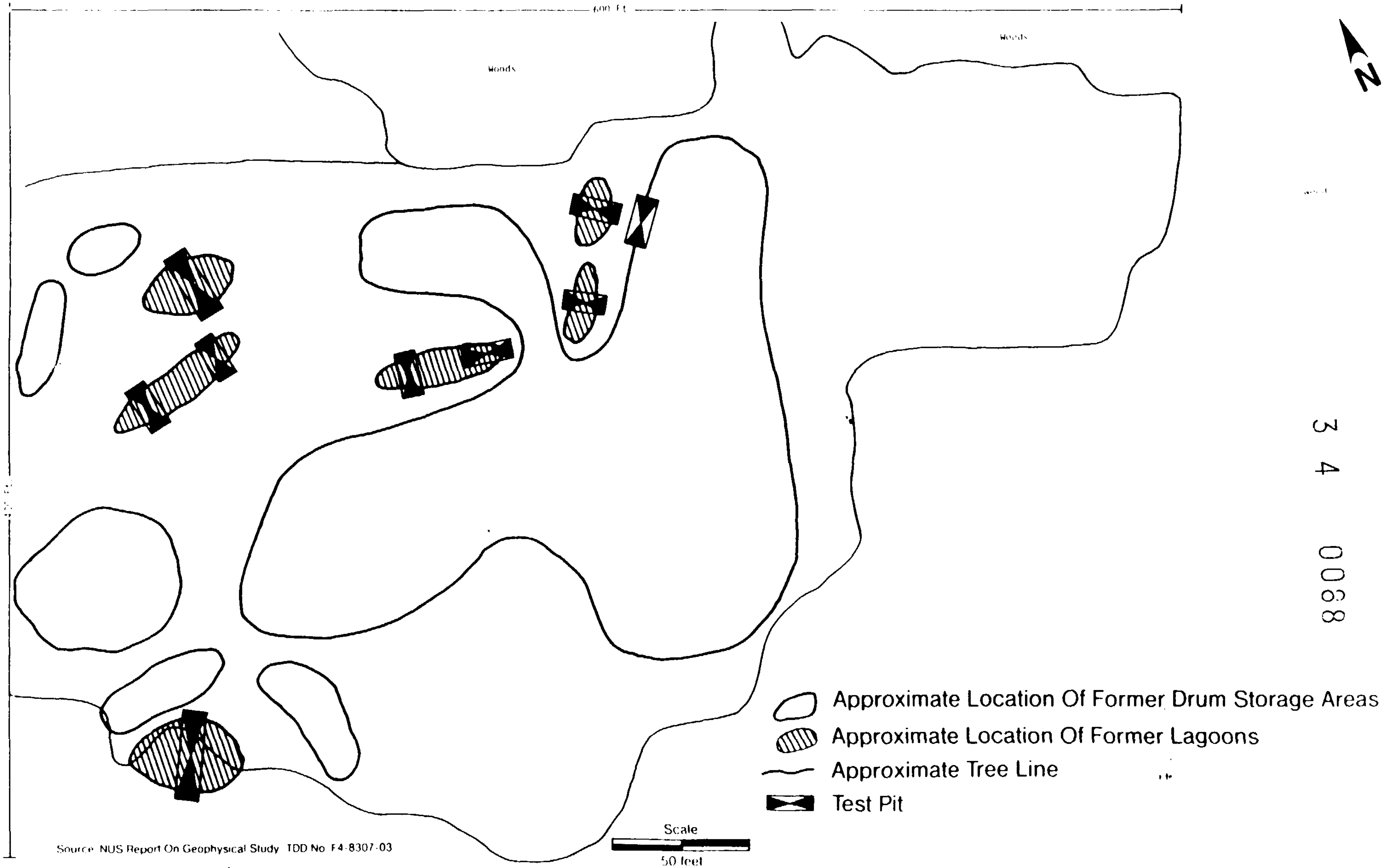


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Figure 3.2

Proposed Test Pit Locations

Medley Farm Site

Gaffney, South Carolina

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for laboratory analysis from each test pit. Procedures for compositing samples will be based on Section 1 of U.S. EPA SW846, 1986. Discrete samples will be selected for the analysis of volatile organic constituents. All analytical samples will be collected using properly decontaminated stainless steel samplers. Sampling procedures for soils subject to chemical analysis will be described in detail in the Project Operations Plan.

3.6.3 Monitoring Well Installation

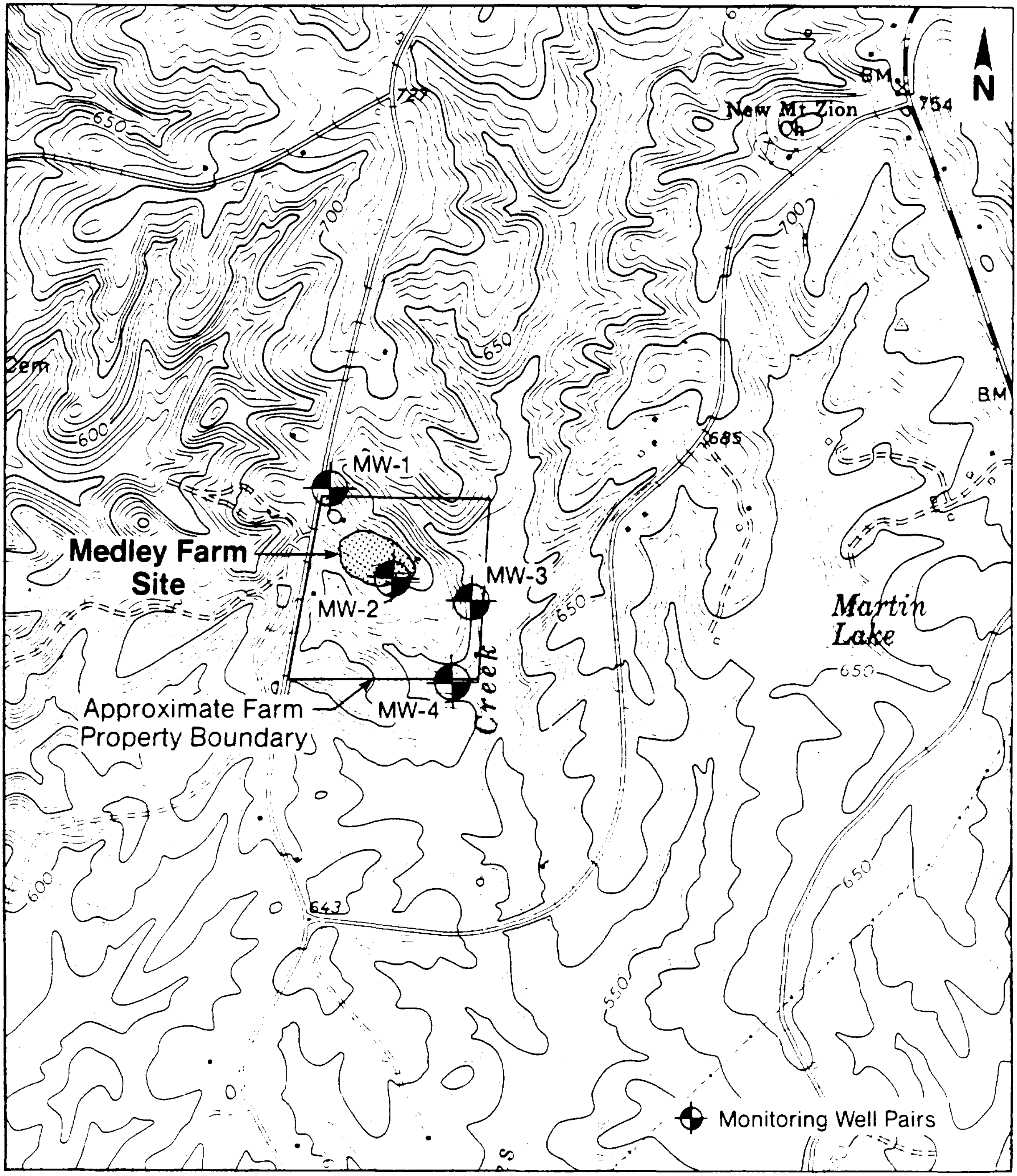
Eight (8) ground water monitoring wells will be installed during the Phase IA field effort to characterize the hydrogeology at the site and to investigate the potential presence and nature of ground water contamination. Monitoring wells will generally be installed in pairs consisting of a water table well and a deeper bedrock well, to investigate the vertical extent of potential contamination. In a case where no appreciable water was encountered above bedrock, only one well would be installed at that location.

The four (4) proposed well-pair locations are shown on Figure 3.3. The rationale for the selection of these locations is presented briefly below:

- MW-1; this well pair is approximately 400 feet northwest of suspected disposal activities, in the presumed upgradient direction. The location of the upgradient well will be determined in part using the results of the soil gas survey. The well pair was placed between the site and Sprouse well to confirm that private well contamination is not the result of site activities.

- MW-2; this well pair is situated within the southeast boundary of the suspected disposal area. This location was selected to enable sampling of ground water immediately downgradient of former disposal and storage areas.

- MW-3 and MW-4; these locations were selected to be downgradient from former site operations, along probable fracture traces which



USGS Pacolet Mills Quadrangle (1969) 3 4 0090 Scale 1:14,100

Figure 3.3

Proposed Locations of Groundwater Monitoring Well Pairs

Medley Farm Site Gaffney, South Carolina

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would constitute the most likely pathways for contaminant migration from the site.

Drilling efforts by the South Carolina Department of Health and Environmental Control conducted during the Preliminary Hydrogeologic Investigation in 1984 indicate that ground water may not be encountered in the saprolite at some locations at the site. If ground water is not encountered in the saprolite at the proposed well locations, a single bedrock well will be completed to a depth of 20 feet below the first occurrence of ground water at that location. The need for additional, deeper bedrock wells or alternate well locations will be assessed after completion of the RI field work. Where the water table occurs in the saprolite, a deeper well will be advanced to approximately 25 feet below auger refusal into the upper portion of the bedrock at a location adjacent to the saprolite well.

Water table wells constructed in saprolite will consist of 15-foot-long, 2-inch I.D., type 304 stainless steel well screens set from approximately five (5) feet above to ten (10) feet below the water table. Filter packs, bentonite seals and grout will be installed in accordance with existing EPA guidelines. A 2-foot-thick layer of very fine sand will be installed immediately above the filter pack of each well prior to installation of the bentonite pellet seal. The bentonite pellet seal will then be allowed to hydrate for a minimum of 30 minutes prior to placement of grout. The low permeability of the fine sand will act as an additional safeguard to ensure that grout contamination of the filter pack adjacent to the well screen will not occur. Slot widths and filter pack gradation will be based on grain size analyses. Riser pipe will consist of National Sanitation Foundation Potable Water Grade, Schedule 40 PVC. The details of well construction will be given in more detail in the POP.

At bedrock well locations the borehole will be advanced the first five (5) feet into the bedrock with an eight (8) inch minimum diameter tri-cone roller bit. A four (4) inch I.D. casing will then be permanently installed with cement/bentonite grout. Casing sections which extend below the water table will consist of Type 304 stainless steel. A 10-foot section of stainless steel casing will be installed above the water level to allow for water level fluctuations. Additional casing sections above the water level in the well will consist of Schedule 40 PVC. After allowing a minimum of 24 hours for the grout to set, the borehole will be advanced an additional 20 feet into the rock by coring. Coring equipment utilizing a split inner barrel will be used to optimize core recovery and the assessment of the bedrock aquifer and water bearing fractures. Since core recovery is often minimal in the upper portion of the bedrock where coarse-grained crystalline rocks are present in the Piedmont, the drilling rate will be closely monitored and recorded on the logs and drill cuttings will be collected to determine the nature of materials penetrated. The cored sections will be left uncased to provide access for packer testing and ground water sampling.

Soil samples for general site characterization will be obtained from the first boring at each well pair location at 5-foot intervals using a standard 2-foot split spoon sampler driven in accordance with ASTM D-1586-67. In this manner the entire overburden thickness penetrated at each location will be sampled at 5-foot intervals. Physical soils analyses will be conducted on selected samples obtained from these locations. The type and approximate number of tests to be performed is as follows:

Test	ASTM Method	Estimated Quantity
Natural Moisture Content	D-2216	12
Sieve Analysis	D-422	8
Hydrometer Analysis	D-422	4
Atterberg Limits	D-4318	8

Monitoring well installation procedures will be described in detail in the Project Operations Plan.

3.6.4 Ground Water Sampling

Ground water samples will be collected from surficial and bedrock monitoring wells at MW-2 and MW-4 during Phase IA. These four samples will be analyzed for full TCL parameter lists to assist in finalizing the site specific parameter list to be utilized in Phase IB sampling efforts. The wells installed at MW-1 and MW-3 will be sampled along with MW-2 and MW-4 during Phase IB and the samples will be analyzed for the indicator parameter list. Ground water samples will be obtained in accordance with EPA Region IV protocols. Ground water sampling procedures will be described in detail in the Project Operations Plan.

3.6.5 Soil Borings

Approximately 12 soil borings will be drilled in suspected disposal and storage areas to further investigate the vertical and horizontal extent of contaminant sources. Six (6) borings will be drilled through suspected former lagoon areas. The additional six (6) borings will be concentrated in the most apparently contaminated former drum storage areas indicated by the soil gas survey conducted in Phase IA. All borings will be conducted in Phase IB after the indicator parameter list is developed. One of these borings will be drilled in an appropriate background location where samples will be collected for determining background levels of metals and pesticides. All soil boring locations will be selected based on the results of the soil gas survey, analyses of soil samples collected from test pits and existing records of former lagoon and drum storage area locations. The soil borings will also supplement the hydrogeologic characterization of the site. All boreholes will be abandoned by tremie grouting with cement/bentonite grout.

The soil borings will be drilled with hollow stem augers. A tri-cone roller bit or approved plug shall be maintained at the bottom of the augers as they are advanced to prevent cuttings from entering. Split spoon soil samples will be collected at five foot intervals by driving a two-foot-long stainless steel split spoon assembly in accordance with ASTM D-1586-67.

Near surface soils sampling and analysis will have been completed in test pitting operations. The sampler will be cleaned prior to each use in accordance with the Region IV SOPQAM (April 1986). Duplicate portions of each sample will be preserved in new, clean glass jars. One set of samples will be preserved for potential chemical analysis in jars provided by the analytical laboratory. The second set will be used for screening with an organic vapor analyzer. The samples collected for organic vapor screening will be placed in 8 ounce jars so that approximately 2½ inches of headspace remains. The top of the jar will be immediately covered with aluminum foil and the jar lid will be tightly closed to seal the jar. The jars will then be shaken thoroughly and stored in a location protected from direct sunlight or extremely high or low temperatures. The soil samples will be allowed to sit for at least one-half hour prior to headspace screening. Headspace screening will be performed by penetrating the aluminum foil jar cover with the sampling probe of the organic vapor analyzer to extract the gas for analysis. Clean soil sample jars (every tenth jar) will be sealed empty and screened to confirm jar cleanliness. Each jar will be labeled to identify the boring number, sample number, depth of sample and the time each sample was obtained. The results of organic vapor screening will be recorded on a log which will include the ambient air temperature at the time screening was conducted, the time each sample was screened, and the background reading on the organic vapor analyzer immediately prior to screening. The results of headspace screening with the organic vapor analyzer will be used in the field to assist in determining whether soil borings should be extended beyond the proposed minimum depth and as a criteria for selecting a confirmation sample for borings drilled outside of suspected disposal areas. This approach is discussed further below. The results of organic vapor screening conducted during sampling from test pits and the results of subsequent laboratory analyses will be reviewed prior to drilling soil borings to confirm the effectiveness of organic vapor analysis as a screening tool at this site.

Each boring will be advanced to a depth of 25 feet during Phase IB. Within the suspected lagoon areas, or other potential waste disposal areas, soil boring samples collected from depths of 10, 15 and 25 feet will be sent to the laboratory for analysis of indicator parameters. Samples from above 10 feet will not be analyzed from borings drilled in areas where samples obtained from test pits provide sufficient near surface characterization. If laboratory analyses of samples obtained from 10 and 15 feet show no contamination, the sample at 25 feet will be discarded at the laboratory. Otherwise, all three samples will be subjected to individual laboratory analyses. All samples will also be subjected to field screening using an organic vapor analyzer as described previously. Results of the field screening will be recorded for correlation with laboratory analytical results.

Soil samples outside of waste disposal or lagoon sites will be collected at 5, 15, and 25 feet during Phase IB. Samples will be analyzed for the indicator parameters determined in Phase IA. If laboratory analyses of samples obtained from 5 and 15 feet show no contamination, the sample at 25 feet will be discarded at the laboratory. Otherwise, all three samples will be analyzed.

All soil borings will be terminated at a depth of 25 feet during Phase I. The need for additional soil samples will be determined after review of all soil, ground water, surface water and sediment analyses by EPA and the RI/FS consultant during the scheduled review period at the conclusion of Phase I activities. The type and levels of contamination found in the soils during Phase I will be viewed in light of overall site conditions in determining the number and type of additional analyses that are required during Phase II. The effectiveness of the field screening methods can also be confirmed at this time to help guide the Phase II sampling program.

All soil samples will be identified in the field by a geologist using visual/manual techniques described in ASTM D-2487 and D-2488. The soils will be classified in accordance with the Unified Soils Classification System and a log of each boring will be produced. The results of organic vapor analyses will be included on the logs.

Physical soils analyses will be conducted on selected soil samples obtained from the test borings to confirm soil classifications made in the field and to provide data for the estimation of hydraulic conductivities. The type, procedures and an estimate of the number of tests which will be performed are summarized below:

Test	ASTM Method	Estimated Quantity
Natural Moisture Content	D-2216	24
Sieve Analysis	D-422	12
Atterberg Limits	D-4318	6

3.6.6 Surface Water and Sediment Sampling

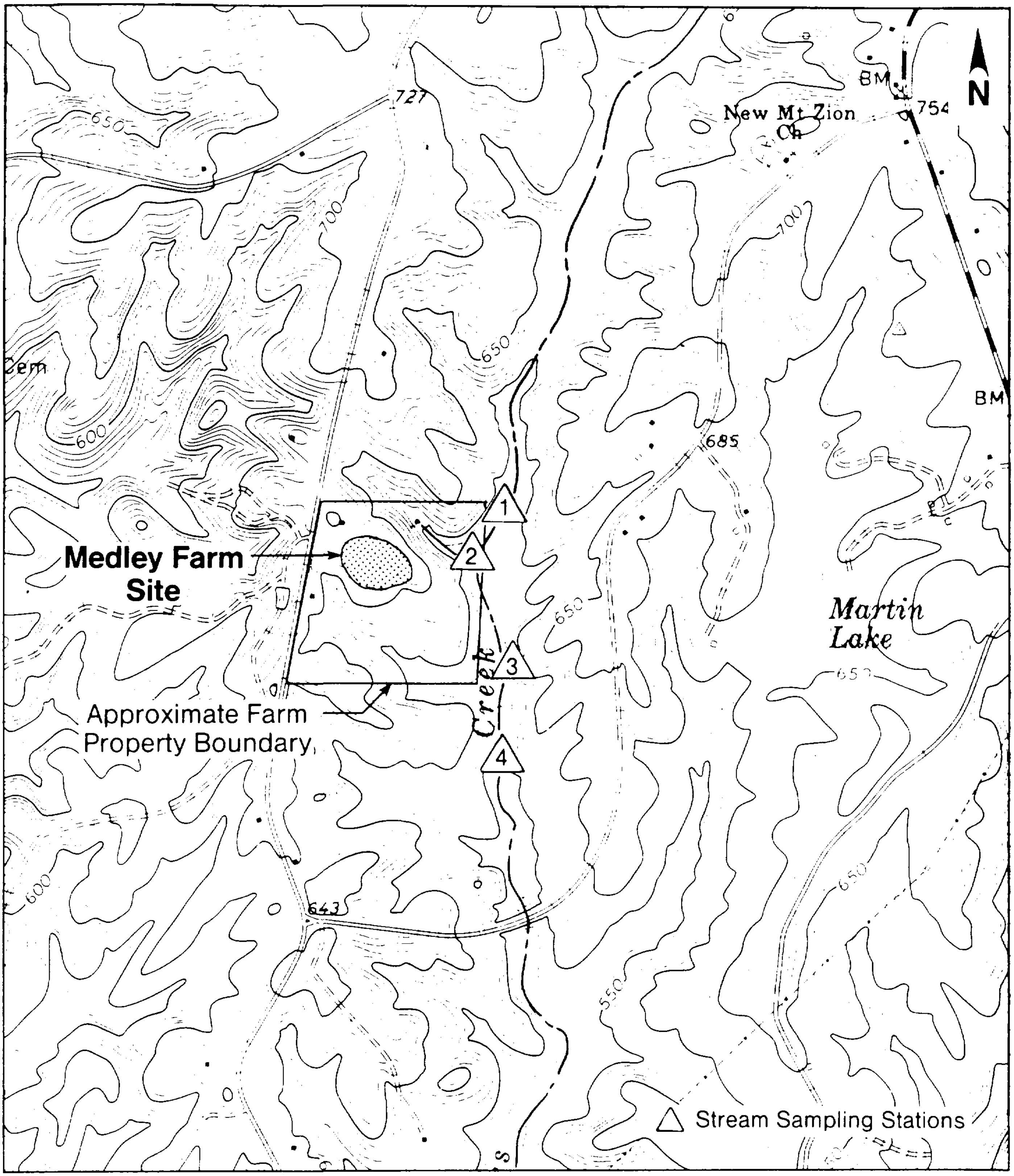
Surface water and sediment samples will be obtained from four (4) locations to determine the presence or absence of contaminants in these areas and to compare the quality of surface water and bottom sediments entering and leaving the site. All surface water and sediment sampling will be conducted during Phase IB and analyzed for the indicator list of parameters. Approximate sampling locations are shown on Figure 3.4. The rationale for the selection of these locations is presented briefly below:

- SW-1/SS-1; this location is upgradient from the site. These samples will define background surface water and stream sediment conditions in Jones Creek.

- SW-2/SS-2; this location was selected to screen for any potential migration of contaminants in this tributary to Jones Creek.

- SW-3/SS-2; this location appears to be immediately downgradient from the Medley Site. These samples will screen for potential contaminant migration directly into Jones creek through base flow recharge or direct surface runoff.

- SW-4/SS-4; this location is further down stream along Jones Creek, also downgradient from the site. These samples are intended to



USGS Pacolet Mills Quadrangle (1969)

Scale 1:14,100

Figure 3.4

Proposed Locations of Stream Sampling Stations

Medley Farm Site Gaffney, South Carolina

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investigate whether contamination may be migrating from the site along this drainage course.

One sediment and one surface water sample will be obtained from each sampling location. These samples will be collected during the Phase IB field effort.

Sampling techniques will be in accordance with EPA Region IV Standard Operating Procedures (SOP, 1986). The measurement of pH, water temperature and specific conductivity will be performed in the field on water samples.

Sampling techniques and equipment will be described in detail in the Project Operations Plan.

3.6.7 Chemical Analyses

The analytical program proposed for the Medley Farm site RI field investigation includes ground water, surface water, stream sediment and soils analyses. The results of chemical analyses conducted during the initial phase of the Remedial Investigation (Phase IA) will be used to develop a set of indicator parameters which will be used for subsequent analyses conducted during the Remedial Investigation. Indicator chemicals will represent the major analytical fractions identified in the Phase IA source characterization and be selected for EPA's approval in accordance with guidelines established in the Superfund Public Health Evaluation Manual (EPA/540/1-86/060). This document defines indicator parameters as chemicals chosen to "represent the most toxic, mobile and persistent chemicals at the site, as well as those present in the largest amounts." This list will be finalized prior to subsequent sampling and analyses.

Samples which will be used to develop the Medley Farms site-specific list of indicator parameters are:

- Ground water samples (4) collected from monitoring wells installed at MW-2 and MW-4 (Figure 3.3);

- Eight (8) composite soil samples collected from test pits excavated at former lagoon sites (6) and two (2) additional selected locations;

These samples will be subjected to completed TCL analyses.

During Phase IB of the Remedial Investigation, the following samples will be collected:

- Ground water samples (8) from wells installed at MW-1, MW-2, MW-3, and MW-4;

- Seven (7) composite soil samples collected from additional test pits excavated in potential source areas;

- Soil samples collected from 12 soil borings proposed for additional source characterizations;

- Four (4) surface water and four (4) sediment samples collected from locations illustrated on Figure 3.4.

The samples listed above will be analyzed for the Medley Farm's site-specific list of indicator parameters developed from the results of the Phase IA chemical analyses.

In addition to the sampling and analyses described above, one sample will be collected from each test pit (15 samples) as they are excavated and stored at the laboratory for potential dioxin analysis. After reviewing the results of all other test pit analyses, two (2) selected samples will be composited and one (1) composite sample will be sent to the laboratory and analyzed for dioxins.

The proposed sampling and analytical program is summarized on Table 3.1.

TABLE 3.1

SUMMARY OF PHASE I SAMPLING AND ANALYTICAL REQUIREMENTS DURING THE REMEDIAL INVESTIGATION

SAMPLE TYPE	TCL	DIOXINS	INDICATORS[1]
Ground Water Samples			
Phase IA	4	0	0
Phase IB	0	0	8
Soil Samples			
Phase IA	8	0	0
Phase IB	0	1	31 - 43[2]
Surface Water Samples			
Phase IA	0	0	0
Phase IB	0	0	4
Sediment Samples			
Phase IA	0	0	0
Phase IB	0	0	4

Notes:

1. The need for additional sampling and analyses will be assessed at completion of this analytical program.

2. The total number of analyses is dependent on the results of initial analyses as described in Section 3.7.1. Metals and pesticides will be included in analyses conducted on soil samples obtained from one boring drilled at an appropriate "background" location.

3.6.8 Hydraulic Testing

In-situ hydraulic testing will be used to evaluate the hydraulic characteristics of the saprolite and bedrock aquifers beneath the site. Slug tests will be performed to determine representative hydraulic conductivity values in the saprolite. Slug tests will be conducted in each of the saprolite water table wells. Slug tests will be performed and evaluated in accordance with procedures described by Hvorslev (U.S. Army Bulletin #36). Rising head permeability tests rather than falling head tests will be performed in all saprolite/water table wells since an induced rise in water level would result in water running out into the unsaturated portion of the gravel pack resulting in inaccurate hydraulic conductivity estimates. A conservative range of permeability values can be obtained by subjecting each test to three methods of analysis. Methods described by Hvorslev (1951), Bower and Rice (1976) and Nguyen and Pinder (1984) will be used. This, along with the proposed grain size analyses, will provide sufficient data to evaluate potential ground water flow and transport rates in the saprolite aquifer.

Water pressure tests will be conducted in the open-hole sections of bedrock wells to measure rock mass permeabilities at those locations. The tests will be conducted using both double and single pneumatic packers in accordance with the general procedures described in the U.S. Bureau of Reclamations Ground Water Manual, 1977. Test zones will be determined by examining the retrieved bedrock cores. Each test zone will typically be tested at three approximately equal pressure steps to provide data for assessing the hydraulics of flow in the bedrock fractures. Maximum test pressures will be based on the available hydraulic head as determined from water level measurements made in wells constructed at the site.

Hydraulic testing procedures will be described in detail in the Project Operations Plan.

During Phase IB, a pump test may be run in one of the bedrock wells to evaluate the interconnectivity of the saprolite and bedrock and to develop more information on the hydrogeologic characteristics of the subsurface environment. This information will be used to evaluate the feasibility of ground water extraction as a method of remediation at the site, if required. The pump test will be run for a minimum of 24 hours at a constant pumping rate. Ground water, pH, specific conductivity, and discharge rate will be monitored throughout the test. At least 12 hours of pretest trend data will be collected immediately prior to conducting the test. Recovery will also be monitored for a minimum of 12 hours. The pump test location will be selected after chemical analyses of ground water samples have been completed. The pump test location will be selected to minimize potential impact to existing ground water conditions. If analyses indicate that the ground water contains hazardous constituents above action levels at the test location, water from the pump test will be discharged according to state requirements or containerized for proper disposal.

Hydraulic testing procedures will be described in detail in the Project Operations Plan.

3.6.9 Summary of Proposed Phase I Activities

The proposed type and quantity of field activities for Phase IA and Phase IB of the Remedial Investigation are given in Table 3.2. Based on the initial information on the site, these appear adequate to characterize the site. The need for Phase II activities will be based on the results of Phase I and the extent of potential contamination.

3.7 PHASE II FIELD INVESTIGATIONS

The need for additional sampling and analyses or other efforts necessary to support the risk assessment and development of remedial alternatives will be evaluated after completion of Phase I. Overall site conditions will be considered in the assessment of individual sampling requirements. If additional well pairs are required, well construction, sampling, and drilling operations will be conducted as described for Phase I. Proposed locations will be submitted to EPA, Region IV at that time for concurrence. Additional soil sampling will also be determined at this time.

All samples collected for analyses during the Phase II Field Investigation will be analyzed for the set of indicator parameters developed as a result of Phase IA TCL analyses.

The analytical laboratory and QA/QC procedures will be the same for Phase II analyses as for Phase I.

TABLE 3.2

SUMMARY OF PHASE I FIELD ACTIVITIES DURING
THE REMEDIAL INVESTIGATION

ACTIVITY/INSTALLATIONS	QUANTITY PHASE IA	PHASE IB
Shallow Ground Water Monitoring Well	4	0
Bedrock Ground Water Monitoring Well	4	0
Soil Gas Survey Receptors	115	0
Test Pits	8	7
Soil Borings	0	12
Surface Water Sampling	0	4
Sediment Sampling	0	4
Hydraulic Testing		
Slug Tests	4	0
Pressure Tests	4	0
Pump Tests	0	1
Bedrock Corings	4	0
Soils Analyses		
Moisture Content	12	24
Sieve Analysis	8	12
Hydrometer Analysis	4	0
Atterberg Limits	8	6

3.8 WATER LEVEL MEASUREMENT AND STREAM GAUGING

Water level measurements will be taken from all monitoring wells installed at the site throughout the course of the Remedial Investigation and from the existing SCDHEC well. Water level measurements will be made on a bi-monthly basis or more frequently during this time frame to monitor water level fluctuations. Surveyed elevations will be established at each well to determine water level elevations. Measurements will be made to the nearest 0.01 ft. These water level measurements will be used to calculate hydraulic gradients and determine directions of ground water flow at the site.

Stream gauging stations will be set up and monitored at two locations on Jones Creek located upgradient and downgradient from the site to estimate surface runoff and ground water contributions from the site. Gauging locations will be based on accessibility and uniformity of stream cross sections.

The base flow contribution from the site to Jones Creek will be evaluated using surface water level and flow measurements obtained from the stream gauging stations and ground water level measurements which will be obtained from all monitoring wells installed during this investigation. Measurements will be taken from stream gauging stations and monitoring wells during the same site visits (same days). Water levels observed in monitoring wells installed in close proximity to the creek (MW-3 and MW-4) will be compared with each other (between different aquifer zones) and with nearby surface water elevations to determine whether hydraulic gradients are present which would induce ground water flow to Jones Creek. Precipitation records will also be obtained through the National Climatic Center in Asheville, North Carolina and a hydrologic budget of the site will be calculated.

3.9 EQUIPMENT DECONTAMINATION AND DISPOSAL

3.9.1 Decontamination of Equipment

The work area of drill rigs and all downhole tools and equipment shall be cleaned with high pressure steam cleaning equipment using potable water at the commencement and completion of the work and between boring or well locations. Backhoes will be cleaned between excavations with a high pressure source of potable water to remove all visual traces of soils between excavations. The drill rigs and excavating equipment will be cleaned to remove excess grease, oils, or caked-on soils from previous work, upon arrival at the site. Equipment which leaks fuel, coolant, crankcase oil, transmission fluid, hydraulic fluid or lubricants will be removed from the site and repaired prior to use.

After steam cleaning, tools and equipment shall be stored on plastic sheeting to avoid contamination from surficial soils or tailings.

Decontamination (cleaning) of sampling equipment and additional procedures performed to avoid potential sample contamination during collection will be described in the Project Operations Plan.

3.9.2 Decontamination Areas

Large equipment and drilling tools will be cleaned in areas specifically designated for this purpose. These areas will be located in existing shallow depressions or will be isolated by the construction of perimeter berms to contain wash water which will be allowed to percolate into the soil. Decontamination sites will be located in areas where near surface soils are expected to be contaminated based on preliminary source characterization efforts. The boundaries of decontamination areas will be surveyed and included on the site plan.

3.9.3 Disposal of Drill Cuttings and Fluids

Drill cuttings, fluids used in drilling, and water purged from wells during development and sampling shall be disposed of on-site. Cuttings from boreholes shall be spread on the ground in the immediate vicinity of the respective drilling sites. Drilling fluids and water purged from wells shall be allowed to percolate into the ground in shallow depressions or holes dug to prevent runoff in the immediate vicinity of each drilling site. These areas shall be filled with the soil removed to create the depression/hole after completion of drilling and sampling activities. Soil removed from test pit excavations shall be used to backfill those excavations.

Ground water monitoring well pair MW-2 will be placed within the southeast boundary of the suspected disposal area. This section of the suspected disposal area is outside of former lagoons and drum storage areas. The NUS geophysical survey indicates that the location for MW-2 is not within an anomalous zone. Nonetheless, an OVA will be used to monitor cuttings from the drilling as part of site health and safety precautions. Cuttings that are significantly above background readings will be containerized with ultimate disposal dependent on results of the MW-2 analyses.

3.10 DATA VALIDATION AND INTERPRETATION

After all field activities are completed, all data involving physical testing (hydraulic slug tests, pumping tests, pressure tests) will be reduced using computer applications programs developed for this purpose. Basic findings will be summarized graphically to assist in the identification of any anomalous data. All data will be reviewed for completeness, accuracy and adherence to QA/QC methods established for the project. Any data to be discarded or of limited use will be reviewed with the PRPs and Region IV representatives before proceeding with the final RI report.

Laboratory data management and validation will be accomplished using an on-line data base management system that allows direct access to the CompuChem data storage. The Environmental site profile system (ESP) data management system provides on-line access to final laboratory test results. ESP is an applications package which will be used to select desired results and download them to internal computer systems. The results will be selected and sorted according to site, data, sampling point, depth, compound, or other criteria. Site summaries and trend analyses will then be prepared for final data validation.

3.11 CONTAMINANT PATHWAY AND TRANSPORT EVALUATION

The remedial alternative eventually selected by USEPA for this site will depend on the source, level, and extent of contamination resulting from waste activities on the site. Basic contaminant transport modeling of the site disposal areas is planned as an attempt to define the potential impacts of residual contamination, and to predict future dispersion and migration patterns. The model will have the capability of simulating flow and transport, in appropriate detail, of the areas of current and potential future influence of the plumes. Special consideration will be given to the potential of Jones Creek, the Big Blue Branch, and Thicketty Creek to act as flow interceptors for the surficial and bedrock aquifers. Much of the effort will be focused on the potential for any residual material to create a violation of ground water MCL's or other appropriate ARAR's in the future if the no action alternative is selected. The remainder of the efforts will involve the quantification of potential migration to identified receptors.

3.12 RISK ASSESSMENT

To assess the need for remedial action at the Medley Farm Site, a baseline risk assessment will be performed during the RI. Detailed guidance for preparation of the risk assessment will be taken from the <u>Superfund Public Health Evaluation Manual</u> (SPEHM) (OSWER Dir. 9285.4-01, October 1986).

The risk assessment process will be divided into four components:

- Contaminant identification
- Exposure assessment
- Toxicity assessment
- Risk characterization

The following provides a brief description of the objectives of each component.

Contaminant Identification. The objective of contaminant identification is to screen the information that is available on hazardous substances or wastes present at the site and to identify contaminants of concern to focus subsequent efforts in the risk assessment process. Contaminants of concern may be selected because of their intrinsic toxicological properties, because they are present in large quantities, or because they are present in potentially critical exposure pathways. To perform the risk assessment as efficiently as possible, "indicator chemicals" will be used where appropriate. The methodology for identifying indicator chemicals is described in the SPHEM.

Exposure Assessment. The objectives of an exposure assessment will be to identify actual or potential exposure pathways, to characterize the potential exposed populations, and to determine the extent of the exposure. These objectives are attained by:

- Identifying exposure pathways
- Analyzing exposed populations
- Estimating expected exposure levels.

Identifying potential exposure pathways allows estimation of how contaminants may migrate from a source to an existing or potential point of contact. An Exposure pathway analysis will consist of four elements:

1. A source and mechanism of chemical release to the environment

2. An environmental transport medium (e.g., air, ground water) for the released chemical

3. A point of potential contact with the contaminated medium (referred to as the exposure point)

4. An exposure route (e.g., inhalation, ingestion) at the contact point.

After the exposure pathway analysis is completed, the potential for exposure to populations will be assessed. The analysis will include not only identification of currently exposed populations but also exposure that may occur in the future if no action is taken at the site to assess the impact of the No Action alternative. While the evaluation will not involve the prediction of future development, the likely land use for the site (and expected exposure scenarios on the basis of that land use) will be evaluated. Part of the evaluation will include the development of a maximum plausible exposure scenario (i.e., worst-case scenario) as well as the probable exposure scenario for comparative purposes during the risk management decision making process.

Toxicity Assessment. To assess the risks from a site, a comparison of acceptable levels of contamination with actual levels identified during the exposure assessment will be made. Contaminant-specific ARARs, when available, will be used to determine acceptable levels. When ARARs are not available or ARARs represent a risk greater than 10^{-4}, acceptable levels will be based on concentration levels that would yield exposures less than or equal to reference doses (RFDs) for noncarcinogens and specified risk levels based on potency factors (q_1*s) for carcinogens, where this information is available.

Risk Characterization. The potential for adverse health or environmental effects for each of the exposure scenarios derived in the exposure assessment will be estimated. These estimates will be attained by integrating information developed during the exposure and toxicity assessments to characterize the potential or actual risk including carcinogenic risks, noncarcinogenic risks, and environmental risks. The final assessment will include a summary of the risks associated with a site including each projected exposure route for contaminants of concern and the distribution of risk across various sectors of the population. Factors to be considered will include the potential effects to both plant and animal populations and the impact on the ecological community.

The risk assessment will be used to identify media potentially requiring remediation at the Medley Farm Site. The results of the baseline risk assessment may indicate that the site poses little or no threat to human health or the environment. In such situations, the FS will be scaled down as appropriate to site-specific potential hazards. The results of the remedial investigation and the baseline risk assessment will therefore serve as the primary means of documenting a no-action decision.

DATA MANAGEMENT PROCEDURES

An RI may generate an extensive amount of information, the quality and validity of which must be consistently well documented because this information will be used to determine potential risks and guide the assessment of potential remedial alternatives. Information to adequately characterize the potential risk associated with the site will be gathered throughout the RI. Informational requirements include:

- Toxicity and quantity of hazardous substances present in relevant media.

- Environmental fate and transport mechanisms within specific environmental media such as physical, chemical, and biological degradation processes and hydrogeological conditions.

- Potential exposure pathways and extent of actual or expected exposure

- Potential human and environmental receptors

- Extent of expected impact or threat; and the likelihood of such impact or threat occurring (i.e., risk characterization)

- "Acceptable" levels of exposure based on regulatory and toxicological information.

3.13 REMEDIAL INVESTIGATION REPORT

Once all data from field sampling, geophysical testing and sample analysis is available, a Draft Remedial Investigation Report will be prepared. The report will characterize the geologic and hydrogeologic conditions at the site and the extent and severity of any identified contamination, summarize all findings of field investigations, and present conclusions related to the contamination identified on site. In general, the report will comply with the EPA guidance document Guidance on Remedial Investigations Under CERCLA. It is anticipated that the Draft will address the following areas.

- Background Information: Site history, history of past removal actions, regional hydrogeology, past sampling efforts.

- RI Approach: Definition of RI objectives summary of technical scope and approach, summary of procedures.

- Field Investigations: Soil borings, test pitting, soil gas survey, monitoring well installations.

- Evaluation of Site Hydrogeologic Conditions: Site geology, hydrology and ground water occurrence, ground water and surface water levels.

- Characterization of Potential Site Contamination: Identification of nature and extent in source areas; evaluation of general toxicity, fate and mobility of identified contaminants; nature and extent in ground water.

- Identification of potential remedial technologies and conclusions

Comments generated by EPA from review of the Draft document will be addressed and incorporated into the Final Remedial Investigation Report.

4.0 FEASIBILITY STUDY TECHNICAL APPROACH

The revised National Oil and Hazardous Substances Contingency Plan (NCP) (40 CFR 300.61-.71) provides the procedures for developing and evaluating cost-effective remedial actions that ensure protection of human health and the environment. Additional direction is given by EPA in the document Guidance on Feasibility Studies Under CERCLA (April, 1985). The Feasibility Study (FS) must also adhere to the requirements of the Superfund Amendments and Reauthorization Act (SARA) of 1986. It is within these guidelines and through consultation with EPA Region IV that the FS will be prepared.

The primary objectives of the Feasibility Study (FS) are:

- to develop appropriate remediation levels based on Federal, State, and local guidance, where available, and through a health-based risk assessment where uniformly applied standards are not available;

- to identify the remedial alternatives and technologies available to reduce the risk to public health and welfare or the environment based on known site characteristics and levels of contamination on-site and/or off-site;

- to perform a detailed evaluation of a limited number of alternatives that remain after the initial screening process;

- to determine applicable or relevant and appropriate requirements (ARARs) of all Federal and State criteria, advisories, and guidance for the implementation of the retained alternatives, as required by the NCP;

- to identify cost effective remedial alternatives that are technologically feasible and attain institutional and regulatory requirements

* to prepare a conceptual design for the remedial alternative selected by USEPA, unless the no action alternative is selected.

4.1 REVIEW OF THE REMEDIAL INVESTIGATION

The first aspect of the FS will be to review the findings and conclusions of the Remedial Investigation (RI). Of particular interest are the assessment of contaminant pathways and the targeted areas of potential site remediation.

4.1.1 Endangerment Assessment

Based on the levels and types of contamination and the assessment of contaminant pathways found in the RI, an endangerment assessment will be developed that evaluates the potential risk posed by hazardous residuals at the site. The overall objective of an endangerment assessment is to provide a determination of the magnitude and probability of actual or potential harm to public health or welfare or the environment by the threatened or actual release of a hazardous substance. The endangerment assessment process consists of four elements:

1. Contaminant Identification
2. Exposure Assessment
3. Toxicity Assessment
4. Risk Characterization

Within these elements, the following factors will be characterized:

1. Hazardous substances present in all relevant media (air, ground water, surface water, soil, etc.)
2. Environmental fate and transport mechanisms for specific environmental media
3. Exposure pathways and extent of expected exposure
4. Populations at risk

5. Intrinsic toxicological properties of specified hazardous substances
6. Extent and likelihood of expected harm

The endangerment assessment will consider the collective demographic, hydrogeologic, physical, chemical and biological factors determined during the RI. Guidance for preparation of the endangerment assessment will come from the EPA publication Endangerment Assessment Handbook (August 1985) and consultation with EPA. The endangerment assessment will be used to define the potential effects now and in the future should the No Action alternative be implemented at the site. This will provide a baseline for evaluating the need and/or relative effectiveness of other proposed alternatives.

4.1.2 Operable Units

The NCP allows potential response actions to be separated into operable units. Based on the available data, the evaluation of remedial action technologies will be divided between source control (soils, sludges, and potentially, buried drums) and migration control (ground water). Objectives for source control measures should be developed to prevent or significantly minimize migration of contamination from the site. Objectives for management of migration measures should prevent or minimize impacts of contamination that has migrated from the site. The physical nature of each media involves the potential selection of different remediation alternatives. An investigation of technologies for the direct treatment of surface waters and sediments and airborne contaminants may also be conducted based on the Remedial Investigation findings. Consideration of control measures of airborne contaminants and surface runoff may be necessary as part of source control remediation alternatives evaluated.

4.2 DEVELOPMENT OF REMEDIATION GUIDELINES

Remediation guidelines will be developed from Federal criteria, State of South Carolina guidance, and other applicable or relevant and appropriate requirements (ARARs) where available, as directed by SARA. A health-based risk assessment will be performed for contaminants or regions of contamination where uniformly applied criteria do not exist. For example, soil standards are not as readily available as ground water standards. Risks associated with soil contamination are through direct contact with surficial soils and through the potential to act as a source of ground water contamination. Surficial soil levels would be based on the health risks of each contaminant through significant soil-to-man pathways. Remediation of contamination at depth would consider the health hazards of the contaminants, their mobility, quantity and migration rates, the location of potential receptors and the State of South Carolina ground water classifications. These activities will require the coordinated efforts of a toxicologist, hydrogeologist, and environmental chemist. The determination of remediation guidelines will require considerable input from the RI, such as contaminant levels and locations, ground water flow patterns and potential receptors. Preliminary cleanup objectives will be developed in consultation with EPA and the State.

Ground water remediation is expected to be guided by Maximum Contaminant Levels (MCL), where available, since these are the identified ARARs. Where MCLs are not available for the contaminants of concern, other standards, such as the Ambient Water Quality Criteria, may be used. Health-based standards based on documented toxicity will be developed for any contaminants without promulgated standards.

Should ground water treatment be required, discharge of treated effluent may be to a surface water or a publicly-owned treatment works (POTW). Discharge to a surface water will require a National Pollution Discharge Elimination System (NPDES) permit and be subject to South Carolina freshwater criteria. The POTW may impose effluent requirements prior to acceptance of treated ground water.

4.3 PRELIMINARY IDENTIFICATION AND SCREENING OF REMEDIAL ALTERNATIVES

Remedial action alternatives will be developed from potential treatment technologies that appear technically feasible considering the type and medium of contamination. The initial list of technologies will be based on past SEC experience at other hazardous waste sites, a review of technical publications, conference proceedings, EPA publications, U. S. Army Toxic and Hazardous Materials Agency (USATHAMA) documents, computer literature searches, and conversations with EPA personnel at the Hazardous Waste Engineering Research Laboratory.

During the FS, these preliminary alternatives will be more fully examined with regard to the type of response action required, e.g., source control, control of off-site migration, and/or removal action. Alternatives associated with contaminated soils (source control) will be evaluated as a separate operable unit from those associated with ground water remediation and other aspects of control of off-site transport (migration control). Alternatives that address each of the five categories described in the NCP Section 330.68 (f) Development of Alternatives, will be developed in this preliminary analysis:

- Alternatives which attain applicable and relevant public health or environmental standards.

- As appropriate, alternatives which exceed applicable and relevant public health or environmental standards.

- Alternatives which do not attain applicable or relevant public health or environmental standards but will reduce the likelihood of present or future threats from hazardous substances. This may include an alternative which closely approaches the level of protection provided by the applicable or relevant standards and meets CERCLA's objective of adequately protecting public health, welfare, and environment.

- Alternatives for treatment or disposal at an off-site facility approved under the Resource Conservation and Recovery Act (RCRA). Such a facility must also be in compliance with all other applicable EPA standards.

- A no action alternative. This could include monitoring and minor site work but no other remedial action.

Based on the data available at this time, potential remedial action alternatives include, but are not limited to, the following:

Source Control

- No action
- Containment
- Capping
- Soil Venting
- Stabilization
- Incineration (on-site and off-site)
- Off-site disposal

Migration Control

- No Action
- Discharge to POTW with and without pretreatment
- Discharge to a surface water after treatment (air stripping, carbon absorption, or both)
- Alternate water supply

All of the alternatives identified for each of the five required categories will be screened to narrow the range of choices. Some alternatives may be discarded based on the results of the Remedial Investigation. The order of criteria for screening each alternative will be (1) technical feasibility, (2) environmental and public health and safety performance, and (3) cost.

<u>Technical Feasibility Screening</u>. The first level of screening will eliminate those alternatives that are not based on proven/acceptable technology or are not compatible with known waste and site characteristics. The final technical screening of each alternative will be based on technical reliability, as determined by appropriate technical criteria developed to meet specific objectives for site remediation and implementation screening. Implementation screening will evaluate specific site characteristics (geology, topography, etc.) and waste characteristics (type, concentrations, and compatibility) that affect implementation of each alternative. For example, since the identified contaminants are predominantly volatile organics, effective in situ source control technologies may be appropriate. These can be equally effective as, but less costly than, excavate-and-treat methods. Similarly, air stripping alone may be sufficient to achieve treatment levels in the ground water, should remediation be required. Capping may also be an effective source control alternative, given the depth to ground water and the site topography. Technologies that have shown superior success in treating similar wastes in pilot-scale studies or that are based on proven concepts may not be rejected solely because they lack field-scale application, since they may represent a more cost effective solution. Further pilot-scale testing, using residuals from the site, may be required before innovative technologies can be fully recommended, however.

<u>Environmental and Public Health Screening</u>. The objective of this screening element is to eliminate those alternatives that adversely impact public health. Potential remedial technologies will be evaluated in terms of: (1) identification of existing and (in practical terms) potential receptors; (2) review of applicable standards and criteria and supporting documentation; (3) estimation of realistic exposures; (4) refinement of applicable criteria; and (5) comparative assessment of site hazards on receptors as a result of each remedial alternative. Such evaluations will enable an assessment to be made of the extent to which remedial actions will affect the potential for exposures to the community and on-site workers and, thereby, risk. Technologies that cannot be implemented without posing an

unacceptable health risk are categorically rejected from further consideration.

An important component of the assessment of any remedial alternative that involves removal and off-site disposal of hazardous materials is consideration of exposures that may result during excavation and transportation. Where appropriate, in situ technologies generally pose fewer health risks than do excavate-and-treat methods.

Cost Screening. Cost estimates for each of the alternatives remaining under consideration will be prepared for further screening of the alternatives. Those alternatives whose associated costs are an order of magnitude higher than other alternatives but do not provide significantly greater benefit or technological reliability will be identified and eliminated under this task.

The results from screening of the remedial alternatives will be summarized for each operable unit (source control and migration control)

4.4 TREATABILITY STUDIES

Laboratory and bench scale treatability studies may be necessary to evaluate the effectiveness of remedial technologies and establish engineering criteria. The necessity of which tests, if any, will be required will be made after review of the alternatives retained form the initial screening. With the data available during preparation of this Work Plan, it is impractical to suggest the nature of extent of any bench or pilot scale tests which may be required for the necessary evaluation of the retained alternatives. A separate work plan will be developed and submitted to the EPA for any proposed bench and/or pilot scale studies should they become necessary for the alternatives evaluation in the FS.

While treatability studies may not be required, certain physical and chemical parameters of the mediums of contamination may help in the evaluation of alternatives. For example, the total organic carbon (TOC) content of the ground water will influence the design and cost of activated carbon units used for treatment. At this time, the following parameters appear to be of interest:

Soil

- Total Organic Carbon
- Porosity
- Permeability
- Density
- Moisture

Ground Water

- Total Organic Carbon
- Hardness
- Fe, Mn
- Temperature
- Alkalinity
- pH

These parameters will be measured at the start of the FS in areas and/or wells that have been indicated in the RI as potential areas for remediation. The pH of soil and ground water samples will be measured during the RI. The need for additional analysis of general physical and chemical parameters will be determined after the initial screening of alternatives.

4.5 DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

Following completion of the screening process described previously and after receiving results of additional information and treatability tasks described above, each of the remaining alternatives will be subjected to detailed analyses as outlined below:

- Technical Feasibility
  - Performance

- Reliability
- Implementation

° Public Health
  - Safety and Exposure for On-Site Workers
  - Exposure Assessment for the Community

° Environmental Assessment
  - Effectiveness of Source or Migration Control
  - Future Use Restrictions

° Institutional Requirements
  - CERCLA Standards, ARARs
  - Other Federal, State, and local standards
  - Permits Required

° Schedule

° Costs
  - Construction
  - O&M
  - Sensitivity Analysis

Detailed analysis of alternatives is required by the National Contingency Plan (NCP), 40 CFR 300.68 (h). Analysis will be divided between source control and migration control, although a coordinated remedial action would require elements of both.

4.5.1 Technical Evaluation

The technical feasibility of an alternative is dependent on how well it can remediate the contaminant at a given disposal area, its reliability based on the equipment required and other hazardous waste applications, and implementability considering the site characteristics. As part of the technical feasibility, the required site work and proposed process configuration will be given. Where available, documentation of the success of the alternative at similar remediation sites will be stated. Where related experience is not available, results of treatability testing will be given to indicate the appropriateness of the remedy. Any additional testing necessary to demonstrate the effectiveness of the alternative will also be noted.

4.5.2 Public Health Assessment

Public Health Assessment (PHA) will be performed for each alternative. The PHA will include an evaluation of each alternative's environmental effects, physical or legal constraints, and compliance with CERCLA and other regulatory requirements. Each alternative will be assessed in terms of the extent to which it will mitigate damage to or protect public health, welfare, and the environment, in comparison with the other remedial alternatives. Specific considerations to be used in the assessment for source control alternatives and off-site alternatives are discussed in the NCP Section 300.68(e). The actual methodology to be used will be consistent with EPA Endangerment Assessment guidelines for a Level 2 (semi-quantitative) assessment and will be reviewed with the EPA. Consideration will be given to standards and criteria developed under federal and state environmental and health statutes.

The NCP requires that remedial actions comply with applicable or relevant and appropriate requirements (ARARs) of other Federal and State criteria, advisories and guidance. For the Medley Farm site, potential ARARs and their areas include:

- Resource Conservation and Recovery Act (RCRA)
  - off-site landfilling requirements
  - incinerator requirements

- Clean Water Act (CWA)

- Safe Drinking Water Act (SDWA)
  - Maximum Contaminant Levels (MCL)

- South Carolina State regulations
  - state drinking water standards
  - surface water, ground water classifications

- Ambient Air Quality Standards (AAQS)

- Occupational Safety and Health Administration (OSHA)
  - worker safety requirements

- Department Transportation (DOT)
  - regulations regarding the transportation of hazardous wastes

ARARs will be discussed in more detail in the Institutional Requirements section under each alternative.

4.5.3 Environmental Assessment

The environmental assessment attempts to qualitatively assess the expected benefit or disbenefit from implementation of the examined alternative. Restriction on future land use and long term maintenance and monitoring requirements are also estimated. Potential economic impacts may not be presented per se, but any alternative that restricts land use may have a negative economic effect on the site and in the community. Results of the environmental assessment will be used in developing a cost-per-level-of-risk removed analysis for the evaluation of site-wide alternatives.

4.5.4 Schedule and Cost Analysis

Schedule estimates will be based on projected availability of materials and labor and may have to be updated at the time of remediation. Construction schedules are based on good weather, the ability to create adequate access, mobilization time, and the availability of required utilities.

The feasibility level cost estimates given with each alternative will be prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final project schedule, the continuity of personnel and engineering between the feasibility study and final design, and other variable factors. Present worth operating costs are a function of chemical usage, material replacement, utility, manpower and maintenance requirements, operating life, interest and inflation rates, and other variable factors. As a result, the final project costs will include appropriate contingencies to account for uncertain cost factors. All of the costs will be approximately minus 30 to plus 50 percent. A sensitivity analysis will be performed on alternatives to estimate the potential variation in costs due to uncertainty regarding specific assumptions.

Present worth costs will be estimated using an interest rate of 10%, compounded annually. For annual costs of an indeterminate nature, such as ground water monitoring and site maintenance, a period of 30 years may be used. Inflation will be taken to be zero (0) percent over the period of analysis.

4.5.5 Comparative Evaluation of Alternatives

The results of the detailed analyses of the alternatives will be organized to ease comparative study and to allow a ranking of the alternatives. The ranking will take into consideration the following five major factors:

- technical considerations;
- incremental cost-benefit analyses;
- institutional considerations;
- environmental impacts of implementation; and
- impact mitigation

The comparative evaluation of alternatives will be integrated into a single analysis that provides a detailed rationale supporting the recommended alternative(s). This process will be applied to each of the operable units identified, recognizing that some alternatives may require integrated or overlapping considerations.

4.6 FEASIBILITY STUDY REPORT

A draft report summarizing the Remedial Investigation and presenting the development, screening, and analysis of alternatives will be prepared. The FS report will include the results of the site characterization and analysis of both source and migration control alternatives. Separate FS reports will not be prepared for each operable unit. The document will be presented to EPA Region IV and the state of South Carolina at this time for technical, format and other comments. All comments received from EPA and South Carolina will be addressed item by item in a written response. The draft final document will then be prepared in accordance with the agreed upon comments.

SEC will be present to assist EPA during the presentation of the Record of Decision (ROD) at the public meeting and during the following comment period. SEC will also provide any fact sheets, diagrams, displays, or other data required by EPA for its presentation. After selection of a remedial action alternative, SEC will generate the final Feasibility Study document.

5.0 PROJECT MANAGEMENT

5.1 ORGANIZATION

At present, the Medley Farm Site Steering Committee is responsible for having the work required of the Consent Order carried out. It is envisioned that the work will be accomplished by various consultants, outside counsel and/or contractors retained by the Steering Committee and that one or more of these parties may be, from time to time, appointed as authorized representatives of the Steering Committee. Coordination of all activities being performed for the Steering Committee with the regulatory agencies, interested parties, and the public will be done by the Steering Committee or authorized representatives.

In accordance with the terms of the Consent Order, the Steering Committee has appointed a Project Coordinator. The Project Coordinator shall be responsible for overseeing the implementation of the requirements of the Consent Order. Communications with the EPA, including reports, approvals, and correspondence concerning activities performed pursuant to the terms and conditions of the Consent Order, shall be directed to the Project Coordinator. The Project Coordinator will be identified prior to the commencement of the Remedial Investigation.

5.2 PROGRESS REPORTS

Written progress reports shall be submitted to the Project Coordinator by all consultants and/or contractors on a monthly basis. The Project Coordinator shall then submit monthly reports to the EPA. At a minimum, these progress reports shall: (1) describe the actions which have been taken toward achieving compliance with this Consent Order; (2) include all results of sampling and tests and all other data received by the Project Coordinator; and (3) include all plans and procedures completed subsequent to EPA approval of the RI/FS Work Plan during the past month, as well as such actions, data and plans which are scheduled for the next month. These reports are to be submitted to EPA by the tenth of each month following the date of EPA approval of the RI/FS Work Plan.

5.3 COMMUNITY RELATIONS SUPPORT

The Medley Farm Site Steering Committee, is committed to supporting the EPA in implementing a community relations plan for the RI/FS work at the site. The Steering Committee will assist the EPA by providing information to be used in community relations efforts and by providing technical personnel familiar with various aspects of the work which is being conducted to be available for public meetings and information sessions. This assistance will be provided for, but may not be limited to, the following:

- Providing area residents with an understanding of the RI/FS process;

- Provide accurate, understandable information concerning the activities associated with the RI/FS work, particularly with regard to on-site activities;

- Provide residents and local officials with an opportunity for input into site related issues and decisions; and

- Clarify and communicate regularly with the community on specific issues of concern such as potential ground water, surface water and soil contamination.

6.0 RI/FS SCHEDULE

The estimated schedule for completion of the RI/FS is given in Figure 6.1. Implementation of the Work Plan has been divided into discrete, definable tasks to indicate the coordination of parallel and consecutive elements through completion of the RI/FS. Descriptions of the numbered tasks are given in Sections 3 and 4 of the Work Plan.

Time zero in the schedule begins once written approval of the RI/FS Work Plan is received from U.S. EPA Region IV and a consultant is retained by the Steering Committee. The major task schedule estimate presumes that the work to be accomplished is that identified in this Work Plan without changes or modifications. Specifically, the field investigations and chemical analyses for Phases I and II in the Remedial Investigation will be as described in Sections 3.6 and 3.7, respectively, and bench/pilot scale testing of alternatives will not be required in the Feasibility Study. Any changes or modifications which are deemed appropriate based on the data collected and/or interim results of the study, and their effect on the estimated schedule, will be reviewed with EPA. Such changes or modifications, including schedule revisions, will be implemented after written approval by EPA. The estimate schedule also presumes timely response by EPA on those work elements requiring EPA approval. A one month period has been allowed for review of identified documents in the given schedule.

SIRRINE ENVIRONMENTAL CONSULTANTS

FIGURE 6.1

SCHEDULE FOR Medley Farm Site Remedial Investigation/Feasibility Study

JOB NO C-8026 DATE 6-8-88 BY JJC/JSC

TASK 1.0 PRELIMINARY ACTIVITIES

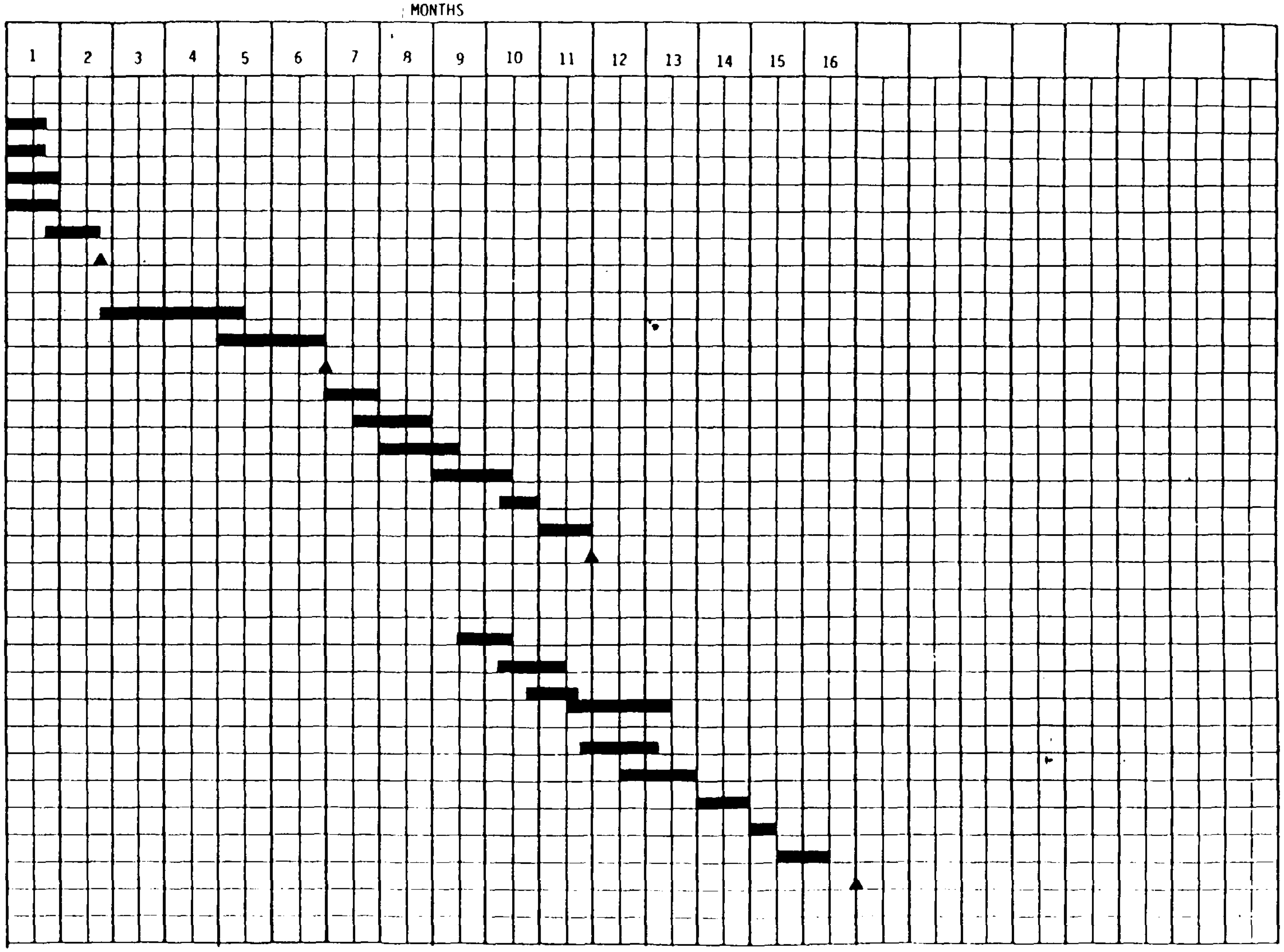
1.1 Site Map Preparation
1.2 Background Data Review
1.3 Project Operations Plan
1.4 Project Health & Safety Plan
1.5 POP and H&S Plan Review
1.6 EPA Approval of POP/H&S Plan

TASK 2.0 REMEDIAL INVESTIGATION

2.1 Phase I Field Investigation
2.2 Data Analysis and Review
2.3 EPA Approval of Indicator Parameters
2.4 Phase IB Field Investigation
2.5 Data Analysis and Review
2.6 RI Draft Report Preparation
2.7 Review of Draft Report**
2.8 RI Final Report Preparation
2.9 Review of RI Final Report
2.10 EPA Approval of Final RI Report

TASK 3.0 FEASIBILITY STUDY

3.1 Review of RI Results
3.2 Develop Remediation Guidelines
3.3 Screening of Alternatives
3.4 Treatability Studies
3.5 Detailed Alternative Analysis
3.6 Draft FS Report Preparation
3.7 Review of Draft FS
3.8 Second Draft FS Report
3.9 Review of Second Draft FS
3.10 Revised FS Report
3.11 ROD Issued
3.12 Final FS Report



* Completion of the given schedule is contingent upon favorable weather and site conditions, sub-contractor availability and performance, and timely review by EPA of submitted materials.

**After EPA review of RI Draft Report, the need for additional Phase II Field Investigations will be evaluated.

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